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Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

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HENRY W. BLAKE and HARRY L. BROWN, *Editors*

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Milestone in Railroad Electrification

O MUCH publicity has been given in recent years to the things that would be accomplished by proed electrification of steam railroad trunk lines that re has perhaps been a tendency to overlook the actual mplishments of roads already under electric opera-. Of course, a projected improvement involving the enditure of large sums of money is big news to the eral press, whereas a continuing performance in a e or less routine manner is seldom given space.

s a matter of fact, there are quite a few very sucful electrifications in this country and abroad that e continued to give excellent service over a considle period of years. Occasionally the record has been ted in the technical papers, but in general little is d of the success of these installations.

ne railroad that obtained a great deal of publicity he early stages of main-line electrification was the York, New Haven & Hartford. Many predictions, rable and adverse, were given, and for a time its ating records were printed. After a few years it ed out of the public eye, and became a part of the pted routine. In this capacity the public has merely cted it to do its part in giving 100 per cent service after day.

he New Haven has not been standing still, however. nsions of the electrified zone have been made from to time and new equipment has been added. The tanding feature of the installation has been its relity in all kinds of weather and its ability to handle burden put on it. It has made an excellent record ie 17 years of service since electric operation began 907.

financial misfortune had not intervened, much rapid progress might have been made in electrion. But the operating management has kept on, ng bit by bit, until now all trains, both freight and enger, in the entire district between New York and Haven are operated electrically, except for a few h run a short distance from the New Haven freight to a branch line. This is the first case where all hing, all freight and all passenger movements over ge section of a main-line railroad have been en- done without the assistance of any steam locoves. It will now afford the best example to date which to derive statistics as to the results that be expected from complete electrification, as up to present time it has never been possible to obtain that did not comprise steam operation to some t. Thus the recent accomplishment of the New n Railroad not only marks a milestone in the ess of that road, but a milestone of importance to ification in general.

Tell This to the Motorists Who Pick Up Railway Patrons

THE outcome of a recent lawsuit in New York calls attention again to the responsibilities incurred by an automobilist who gives a lift to a person waiting for a street car. In the case in question the plaintiff claimed damages for injuries suffered while he was riding as a guest in the automobile of the defendant. The case was settled out of court by the payment of substantial damages.

The general principle has been established in New York that the owner or operator of an automobile owes to an invited guest the duty to exercise reasonable care in its operation, and not unreasonably to expose him to danger or injury by increasing the hazard of travel. A guest is entitled to recover from the owner for an injury resulting from a failure to use such care. The fact that the owner of the automobile is not a common carrier, and is not transporting a passenger for hire, does not relieve him of responsibility. In order for the guest to recover damages, however, he must show negligence or carelessness on the part of the owner.

If it becomes generally understood that giving a lift to another person may, in case of accident, involve the automobile driver in more serious difficulty than if he were alone, this may act as a determent to such generosity—which is a serious form of competition for street railways, especially in smaller cities.

Railways Should Not be Blamed for Delays Caused by Parades

THIS is the season of parades. Decoration Day has just passed and the Fourth of July looms ahead. Circuses are now on tour and June brings with it the great political conventions and consequent demonstrations. These parades will be held on the principal streets of various cities, resulting in serious interruptions to electric railway service, and the companies will be unfairly blamed for these delays.

If the public understood exactly what a parade meant in the way of interruption to street car service it might diminish the enthusiasm for the spectacle. Should the railway suffer a breakdown such that no cars moved for a couple of hours, an outcry from the angry populace would be heard from one end of the town to the other. Criticism of the trolley company would be on every tongue. It would be considered an outrage that people should be deprived of transportation for so long a time. Yet the municipal authorities in order to please a comparatively small group of people, a fraternal, religious or political organization, allow a parade to be held where it completely disrupts the trolley service.

Certainly there is no good reason why a parade should

be given preference over street railway operation—why a large number of people should be discommoded to please a few. If an interruption to service resulting from some neglect on the part of the railway is considered reprehensible, why isn't an interruption to service resulting from the politician's desire to gratify a particular group of people equally undesirable? Here is a chance to apply the publicity policy mentioned in an editorial in the JOURNAL on May 24. If the railway, after a long delay caused by a parade, tells the public just what caused the delay, it will lessen the criticism directed at the company and may eventually result in a reduction in the number of parades.

The Auditor Often a Neglected Asset

VISITS to various properties show a great variety in the duties performed by auditors in connection with the many statistical statements compiled by them.

On some properties the auditor assumes that his work is completed when these statements are prepared according to the standard form and are submitted to the executives concerned in the minimum time after the figures are collected.

On another group of roads the auditor goes farther than this and prepares special analyses of the most significant figures, which he presents with written or verbal comments on their meaning to the executives most concerned. For this service the auditor should be well fitted. While he may not be as familiar with many of the details of operation as the head of the department to whom he submits these analyses and comments, he is usually more used to working with and comparing figures, and generally also he has a broader viewpoint of the financial status and needs of the entire property than the head of any single operating department. Hence his comparisons and conclusions ought to be of great help if offered tactfully so that he does not appear to be interfering with the direction of another department. The right kind of a department head, of course, will welcome such co-operation, because figures have value only to the extent to which they are used. If they are filed away without study, the railway might just as well save the cost of getting them up.

Still other auditors go farther, with advantage to the company. They realize that the executives to whom they submit their analyses have duties connected with the physical operation of the properties which demand a great share of their time and that the real significance disclosed by these financial analyses may be overlooked in the press of other matters—perhaps not more important but at least more immediate. In such cases the auditor can very properly bring the matter again to the attention of the executive who has power to act. He need not suggest the remedy. He need not even urge action. But at least he can take the responsibility of seeing that the matter receives consideration and is not lost in the limbo of forgotten things.

Which one of these several attitudes will be taken by the accountant will depend very largely on the manager of the property. If he indicates by his manner that he wants nothing more than statistics and financial statements, these are about all he will get. But if he does this he will fail to take advantage of what should be a great asset of the property. The auditor is not only accustomed to interpreting figures, but he is the only department head who has to keep in touch with what is going on in all departments. The wise executive will encourage him to keep up his study of the finances of the property and to submit any analyses of them which he thinks concern the economical operation of the road.

The good which an accountant can do does not end even with these services. As with the treasurer, who is the chief financial adviser of the company, his advice or that of both should be sought in the case of matters relating to financial transactions, especially those that are unusual. As an example, a certain railway some time ago leased another railway, agreeing to pay a specified sum as annual rental. But after the contract had been signed and sent to the auditor for filing he immediately saw that no provision had been made for terms of payment. Was this sum to be paid annually, quarterly or monthly, and was it to be paid at the beginning or at the end of each such period? As this part of the contract related directly to the disbursements which the auditor would have to provide for, he was impressed with the fact that this detail had not been covered. This point had not occurred to the lawyers who drew the lease.

Obviously, it seems, the broad knowledge which the auditor has of the finances of all departments of a railway should be utilized to the fullest possibilities.

Making the Breaks in Traffic

THE average schedule speed attained on a street railway system depends to a considerable degree upon the effort exercised by the car crews to be ready to make the breaks in traffic. There is a common tendency on the part of motormen to coast along leisurely if they see that traffic is against them at the intersection which the car is approaching. This practice is not good in two respects.

The first and minor reason is that it is annoying to the passengers who want to get off at this intersection to have the car approach their destination at so slow a pace. The more important reason is that often by the time the car reaches the intersection the whistle has blown, and then, before the passengers are off and the new ones on, the whistle has again blown and the car has to wait another change of the traffic flow. Had this car been operated at good speed and brought as quickly as possible to the stopping point, it would have had time to make its passenger interchange and been ready to proceed with the first change of traffic in its favor.

Riding on a certain car recently it was noted that the motorman lost the break in traffic in this way three times in a mile and a half, simply because his operation of the car was as though he had "all day" to get to the end of the line. Unfortunately, in the particular city in which this was observed, there is a notable absence of snap and get-up-and-go all over the railway system. Even though the equipment here is old and slow as compared with modern equipment, the trainmen are by no means getting the full speed capacity out of what they have.

Thus, the point of this comment about missing the breaks in traffic is exaggerated on the property in mind, but it is a point that could well be given attention on many systems.

The Colonial Express, a 13-Car Through Limited Train, Operated Between Boston and Washington, Runs 84 Miles on Electrified Track Between New Haven, Conn., and Manhattan Transfer, New Jersey, via the Hell Gate Bridge Route Through New York City—Newest Type Locomotive

New Haven Inaugurates 100 per Cent Electric Operation

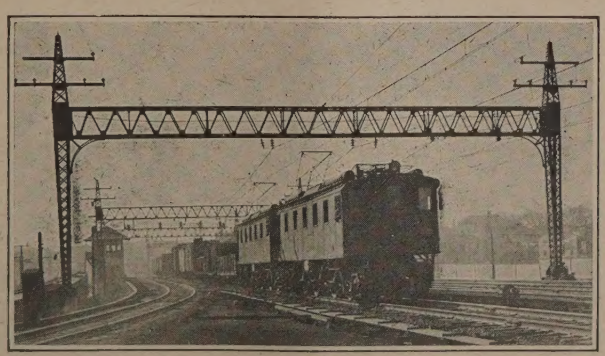
With the Addition of 12 Electric Locomotives and Extension to the Power Plant, the Use of Steam Engines Has Been Eliminated in the Through Electrified Service Between New York and New Haven

By H. F. Brown
Assistant Electrical Engineer New York, New Haven & Hartford Railroad, New Haven, Conn.

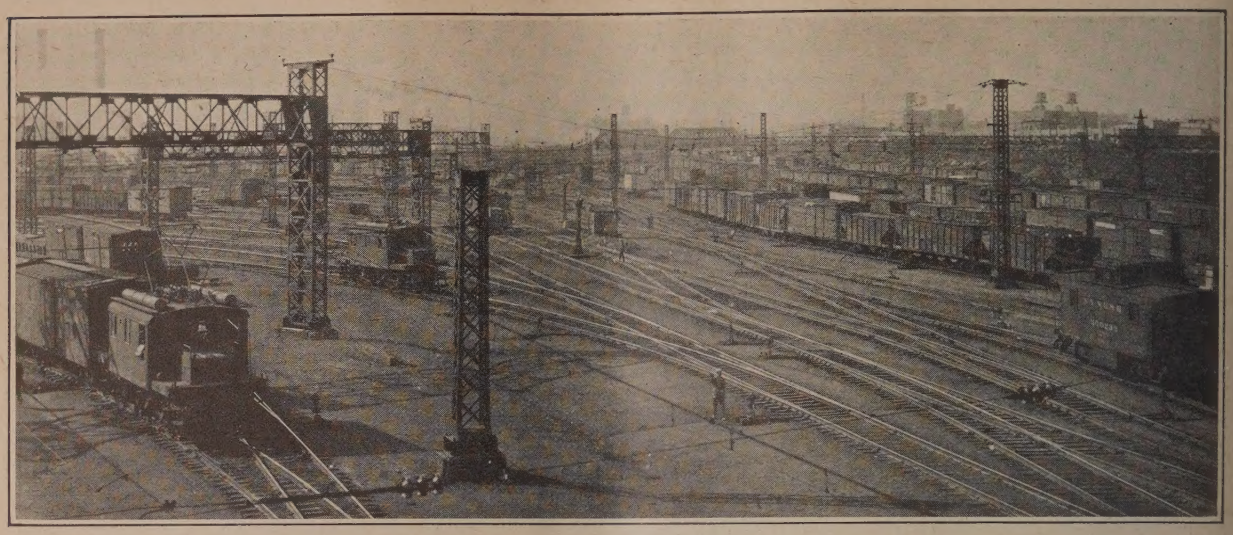
DURING the past year the New York, New Haven & Hartford Railroad has had under construction with the Baldwin Locomotive and Westinghouse Companies twelve 180-ton a.c.-d.c. electric passenger locomotives, similar in construction to the five a.c.-d.c. locomotives ordered in 1918, with the exception of a slight change in gear ratio and the length of the cab. The delivery of these locomotives commenced in November, 1923, and in April, 1924, the last one was received and placed in service between New York and New Haven. They are equipped with 12 Westinghouse 409-C-2 motors, and with the gear ratio of 25:89 have a continuous tractive effort, with forced ventilation, of 16,000 lb., with a maximum momentary tractive effort, for starting, of 47,500 lb.

During the past year also the New Haven Railroad has been replacing one of the 3,750-kva., 11,000-volt turbo-generator units originally installed in its Cos Cob power plant with a new unit having a single-phase rating of 12,860 kva. at 70 per cent power factor, not only to increase the plant capacity but to take advantage of the better economies of larger units of latest design. This new unit was placed in daily operation during January, 1924.

Prior to the advent of these 12 new electric locomotives, it was the custom to change locomotives at Stamford for many of the through passenger trains, as well as for all the passenger trains which leave the main line at South Norwalk, Bridgeport and Devon, substituting steam locomotives for the latter trains and for many of the through trains, or straight alternating-current electric locomotives, originally purchased for freight service, on some of the through trains to New Haven during the



The Heavy Freight Trains on the New Haven Are Hauled by Double-Headed A.-C. Locomotives



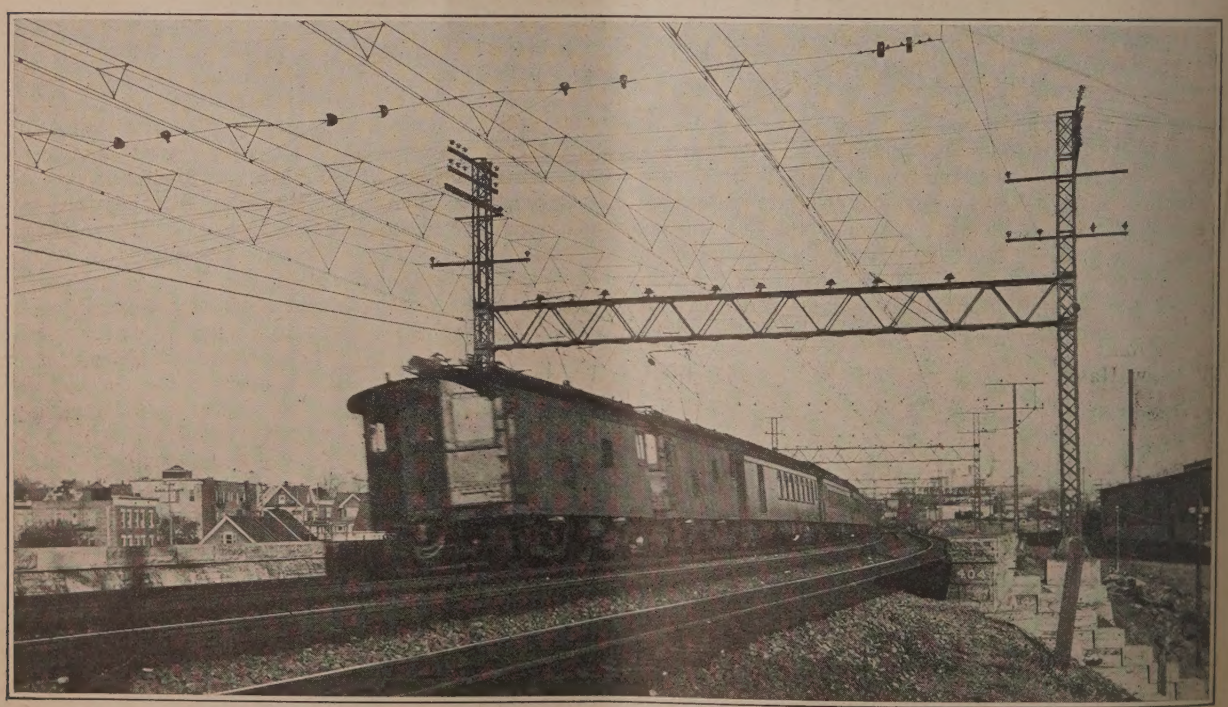
The Oak Point Yard in New York City Entirely Electrically Operated with Switching Locomotives Designed for This Service

summer months, when heating of cars is not required.

By March 1, 1924, enough of the new locomotives were in service to eliminate the necessity for changing locomotives on most of the through trains at Stamford; and by the end of April, when the summer time-table went into effect, all of the passenger trains running over the electrified zone were operated with electric locomotives. Trains which leave the main line at South Norwalk and Bridgeport now change to steam locomotives at these points.

With the new time-table, all the Hell Gate Bridge trains operating into the Pennsylvania Station, New York, have also been electrified and are now operated by the straight alternating-current locomotives, or by the 180-ton a.c.-d.c. type, changing power, as formerly, at Harold Avenue, Long Island City, from which point these trains are operated by the Pennsylvania direct-current electric locomotives. The popular "Colonial" and "Federal" express trains, which have been operated for many years as through trains between Boston and Washington, formerly being ferried from the Harlem River around New York into Jersey City, are thus now hauled electrically from New Haven into Manhattan Transfer, Newark, N. J., a distance of 84 miles.

Due to displacing the alternating-current electric freight locomotives from the passenger service east of Stamford, it was possible, about March 1 of this year, to inaugurate electric operation of all through freight trains between Harlem River, Oak Point, and Cedar Hill, New Haven, terminals. During March 150,052,-075 ton-miles, trailing load, of freight were handled electrically, the average daily mileage for all locomo-



Electric Passenger Express Train on the New Haven, Showing Original Catenary Overhead and Original Type of Locomotive

ves assigned to freight service, including those in the
iop; being 117.49, and for serviceable locomotives
ore than 170 miles.

In order to speed up the movement of freight the
reater number of the trains are dispatched from the
rminals as soon as enough cars are ready to make up
trainload suitable for a single locomotive unit,
though some of the heavy "drags" of approximately
000 tons (80 to 100 cars) are handled at lower speeds
ith two units operated in multiple.

Some additional facilities have been required for this
l-electric service, notably an enlarged steam locomo-
ve terminal at South Norwalk; electrification of sev-
al hundred feet of a branch line at Bridgeport, used
r power interchange and for picking up and dropping
f cars at this point, and an additional electric loco-
otive storage track with inspection pit and pantograph
spection platform at the New Haven terminal.

In addition to the new locomotives, five new train-
eating units or tenders have been purchased, three of
hich have been in service since April. These contain
l flash boilers and tanks for the fuel oil and water
ecessary for train heating, and are primarily intended
r use with the straight alternating-current locomo-
ves, which have no train-heating equipment, when
ese are used in passenger and express service on the
ell Gate Bridge trains.

The Original Electric Locomotives Have Averaged 250 Miles per Day

It is expected that one of the economies of this all-
ectric operation will result in time from the reduction
the serious corrosion of the overhead structures
nd in reduced insulator maintenance. Continued steam
peration, with its attendant smoke and gases, has been
rgely responsible for the difficulties experienced in
is connection. The new locomotives will also allow a
rge margin in the operation of the original 41 electric
assenger locomotives, some of which have made more
an a million miles since their purchase in 1906. This
shown by the passenger locomotive-miles per day,
hich averaged 171 in March, 1924, against 220.5 for
arch, 1923. These have averaged in the past as high
s 250 miles per day.

There remains one section of the electric zone—that
etween New Haven and Bridgeport, over which some
eam operation will have to be continued on account of
s being part of the route of the heavy freight traffic
etween Cedar Hill and Maybrook (the Poughkeepsie
ridge Route) as well as part of the route of the New
ork-Waterbury-Winsted passenger trains which change
ower at Bridgeport. All of these trains leave the main
ne at Devon.

The New Haven now has operating in heavy electric
raction service 118 single-phase a.c. electric locomotives
f the following types:

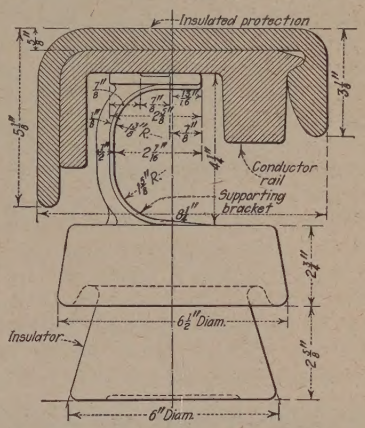
41	110-ton a.c.-d.c. for passenger service.
6	120-ton a.c.-d.c. for passenger service.
17	180-ton a.c.-d.c. for passenger service.
36	120-ton a.c. for freight service.
1	135-ton a.c. for freight service.
1	140-ton a.c. for freight service.
16	80-ton a.c. for switching service.

In addition to the above locomotives, there are 29
c.-d.c. and eight a.c. motor cars, together with 68
ailers, all with multiple-unit control.

Thus, with its electric operation of heavy through pas-
nger and freight service, yard switching, and electric
suburban motor car trains, the New Haven electrifica-
tion comprises the entire field of heavy electric traction,
in a magnitude not equaled by any other railroad.

Under-Contact Conductor Rail

A PROTECTED conductor rail and support, which comply with conditions governing the clearances in force on British railways, have been developed in London following a careful study of the successful experience with under-contact conductor rails in the United States and the Argentine. It is designed to give efficient protection to the third rail at 1,500 volts. A C-shaped bracket, mounted in an insulator, supports the U-shaped conductor rail, over which is hung the insulation in the form of an inverted trough. The rail section used, which is of a peculiar shape, as shown in the drawing, has an approximate weight of 100 lb. per yard. Its composition is based on experience gained in the production of under-contact conductor rails at present in use. The contact surface of the section allows for a considerable amount of wear.



Conductor Rail Is Mounted on "C" Insulated Brackets. Insulation Is Laid on Conductor Rail and Is Held in Position by Lip

The rail is so balanced that it is simply laid on the insulated C brackets and maintains itself in position by its own weight, the center of gravity being below the point of support. In joining the rail sections, single fish plates are used, held with ⅞-in. countersunk bolts.

The protective covering, of molded composition, affords adequate insulation, is non-inflammable, durable, and is said to be free from warping. This is applied in 6-ft. lengths, permitting standard straight sections to be used on most curves. The protective covering is simply slipped over the rail and is self-locking when once in position, as each length laps over the adjacent length, with the length over the incline bolted to the conductor rail.

The current-collector gear is of parallelogram construction, and may be used on either over-contact or under-contact rail, without adjustment. To keep the tension on the rail the same for both, the under-contact rail is mounted several inches lower than the over-contact rail. The shoe is of cast iron, chamfered at both ends. A thin elbow permits the shoe to break off if it meets an obstruction without further damage to the rail or shoe gear.

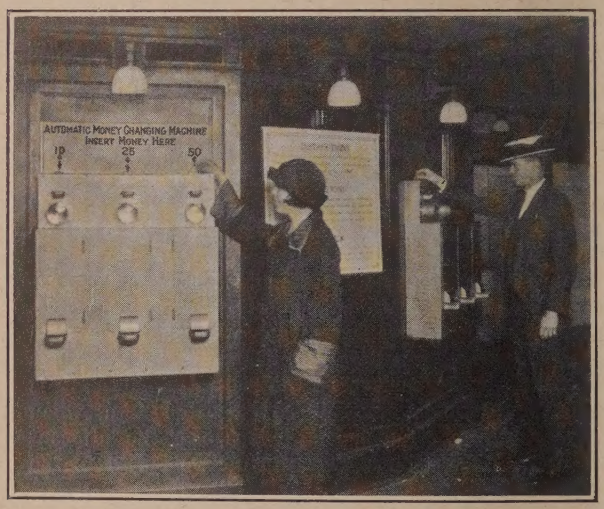
Tests conducted on the London, Midland & Scottish Railway have resulted in the successful collection of current at 1,200 volts and a speed of 70 m.p.h. Tests were made to determine the efficiency of the covering. Some of these were carried out dry, and others after soaking the protective covering in a solution of salt water. In neither case was any deflection obtained on a milli-ammeter, with the rail connected up to the 1,200-volt circuit.

Interborough Tries Change-Making Machines

The Action of the Machine Is Automatic, an Electric Contact Device Controlling the Release of the Necessary Change When a Coin Is Inserted

MACHINES for automatically changing dimes, quarters and half dollars have been installed for trial in the northbound Seventy-seventh Street station of the Lexington Avenue subway, operated by the Interborough Rapid Transit Company, New York. The machine was developed by Frank Hedley, president and general manager, and J. S. Doyle, assistant general manager. The present installation consists of two units, which have been installed in the panels of the change-making booth at the Seventy-seventh Street station. The machines are approximately 30 in. square and the coin to be changed is inserted through slots at the top. A sign over the machine reads "Automatic Money Changing Machine—Insert Money Here" and arrows point to the slots for the reception of the coins.

When a coin is inserted it drops upon two contact points in the change-making machine and establishes an electric circuit to release the necessary change. The coin is held in position back of a magnifying lens, so that it can readily be seen by the person who inserts the coin. Similar lenses on the back of the machine inside the booth also provide for an operator's inspection. A switch is provided in the operator's booth so that he can open the circuit and thus automatically prevent the issuing of change, should it be necessary to retain a coin for inspection. Inserting a second coin in the slot releases the one in view and the second coin takes its position upon the inspection contact.



Automatic Change-Making Machines in Seventy-seventh Street Station of Interborough Rapid Transit Subway, New York

Should a coin of other denomination than that indicated be inserted in the slot, it drops into a receptacle immediately over the magnifying lens so that it can be returned. Change for the money inserted comes out in receptacles at the bottom of the machine.

In the present installation doors are provided on the front side for filling the machines with change and for taking out money which has passed through the machine. When the machines are extended to use in other stations, however, it is the intention to provide doors only on the inside of the change booth. It may also be necessary to make the machines up in individual units, one for dimes, one for quarters and a third for half dollars.

While the present installation is entirely in the nature of a trial, it is the intention of the officials to extend the use of these change-making machines to other stations on the system as soon as they are satisfied with its working. At congested points, like Times Square, it may be desirable to install these at frequent and convenient locations and have an attendant to oversee their operation and fill the machines with change as is required. Where there are separate stations on opposite sides of the tracks a single attendant on the traffic side should be able to take care of the change-making machines at both locations. This also applies to stations which have more than one entrance. In this latter case one attendant could take care of several machines, which would be installed at the most convenient points where passengers pass through turnstiles.

Statistics collected by the Interborough Rapid Transit Company indicate that approximately 50 per cent of the change issued at subway stations is for dimes, so at heavy traffic centers it may be necessary to have a larger number of machines for changing dimes than for the other denominations. The mounting of individual units would also be of assistance in taking care of maintenance, as a single machine could be removed and replaced by another without interruption to service and without interfering with adjacent machines.

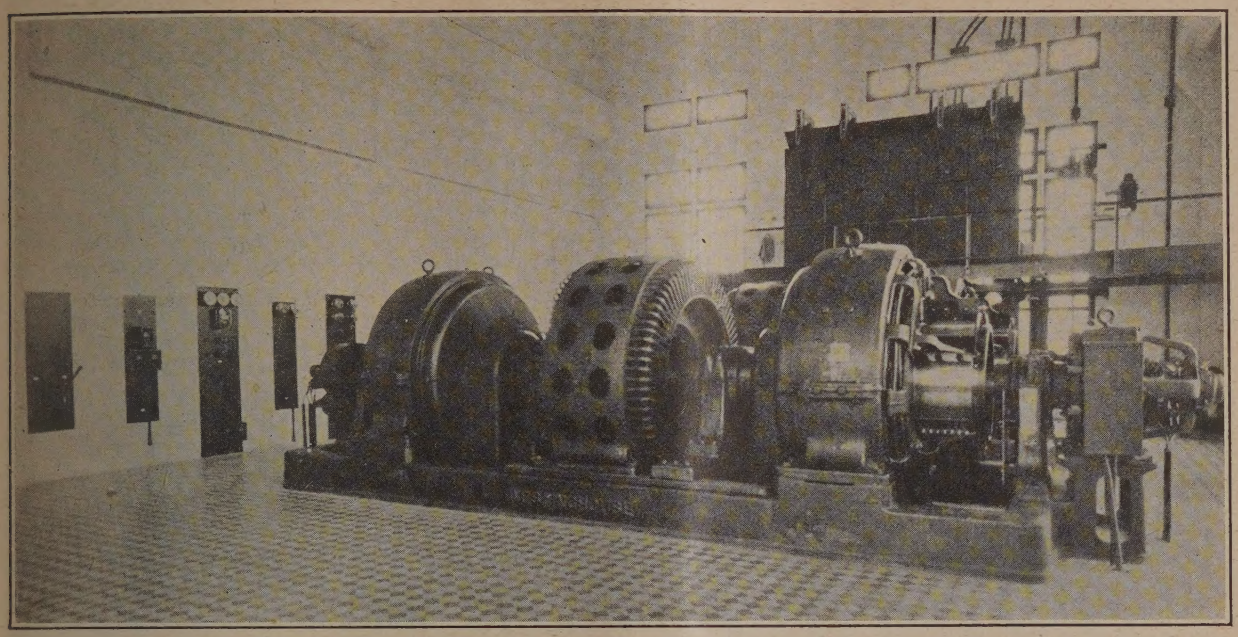
The three-unit machines at present being tried provide for change up to approximately $175. Another interesting point in the statistics gathered is that at present approximately 5 per cent of the riders ask for change at fare booths, the remaining 95 per cent obtaining their change at other points.

After the installation of the machines, the company expects to keep accurate records regarding the amount of money changed and the various denominations to serve as a guide in determining the best size for the machines and the number of individual units needed.

Encouraging Trainmen to Tell the Truth About Accidents

AN UNREMITTING safety campaign without any intensive drive or spasmodic effort on the Middlesex & Boston Street Railway reduced the number of accidents from 147 in January, 1923, to only fifty-eight in January, 1924. Carefully formulated rules for the operation of cars and strict enforcement all the time are thought by the company to have been responsible for this improvement. Although the reduction is perhaps partly explained by better street conditions, the number of automobile collisions decreasing from seventy-seven to fifteen, the general improvement also was quite noticeable.

It is the custom of this railway to take no disciplinary action against a motorman after an accident provided he tells the entire truth concerning it. On the other hand if he is detected in any false statements concerning the circumstances of the accident he is invariably discharged. No excuses whatever are accepted for a car collision. The rule provides that no car under power shall follow another closer than 500 ft. and shall never approach closer than two car lengths. Enforcement of this rule has resulted in almost complete elimination of car collisions.



Interior of Quilicura Substation, Showing One of the 2,000-Kw. Motor-Generator Sets and Switchboards

Power Distribution System of Chilean State Railways Electrification

Five Stations, Each with Two 2,000-Kw. Motor-Generators, Supply 3,000-Volt D. C. for Operating This Electrified Railroad—A Special Method of Integrating Power Demand Is Used in Connection with Bills of the Power Company Supplying the Railway

By D. C. Hershberger
General Engineer Westinghouse Electric & Manufacturing Company

RELIABILITY of operation has been the main objective of the designers of the power equipment for the electrification of the Chilean State Railways between the seaport of Valparaiso and Santiago, the capital and metropolis of Chile, 116 miles distant. The contact line is supplied with direct current at 3,000 volts from alternating-current power stations, making a.c.-d.c. substations an essential link in the power supply system.

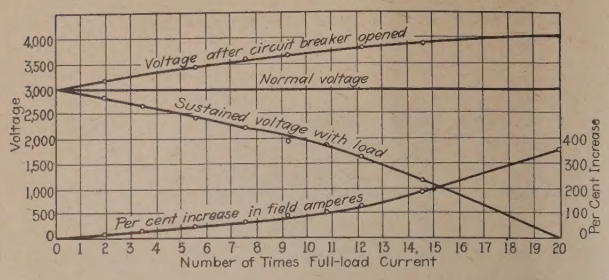
This first zone of the electrification, now in full operation, is equipped with five modern synchronous motor-generator substations which include design features that have proved most effective in transcontinental service in the United States.

Part of the electrified zone between Valparaiso and Los Andes forms a link in the only transcontinental line in operation across South America. This route has one terminal at Valparaiso on the Pacific Ocean and the other at Buenos Aires, Argentina, on the Atlantic. The first zone to be electrified comprises approximately 10 per cent of the entire route mileage of the Chilean State Railways broad-gage lines.

Transportation conditions are especially severe in this district, owing to the mountain range between Santiago and the coast. The maximum grades are 2¼ per cent and the shortest curves 10 deg., both of which conditions made steam operation very difficult; in fact, the limit of capacity with steam had virtually been reached. With electric motive power the track capacity has been increased enormously, putting off for many years the construction of second tracks, as the track capacity with electric operation is more than three times as great as before, and it is susceptible of still further increase by the use of heavier motive power units, and a corresponding increase in the size of substations and overhead distribution system.

Energy Is Supplied by a Private Company

Although the Chilean government had control of sufficient water power sites that it could have constructed its own generating stations and transmission system, it was decided to purchase energy, thus simplifying the operation and reducing the necessary capital for the electrification of the first section. It also makes possible a greater diversification of load, especially as other customers are supplied from the same transmission lines. Accordingly arrangements were made with the Compania Chilena de Electricidad, Limitada, for the supply of the necessary energy. This company has recently completed a 25,000-kva. hydro-electric generating station at Maitenes, 37 miles southeast of Santiago. Power is supplied from this station, the 15,000-kva. Florida hydro-electric station and the 20,000-kva. Mapocho steam station, which also furnish



Direct-Current Terminal Voltage Characteristics of the 2,000-Kw. Motor-Generator

power to Santiago and more recently to Valparaiso, Los Andes and intermediate cities.

The railroad owns the substations for converting the railway power in the first electrified zone, while the power company owns the transmission lines. Since other customers are served by the same transmission system the energy for the railway is metered separately at each railway substation. This is done on the low-tension side of the transformers supplying the motor-generator sets, a nominal amount being added to the meter readings to compensate for transformer losses.

In general the railroad has preference over other customers in obtaining power for the operation of trains, shops, engine houses and for station lighting, except under certain conditions where this preference would not be exercised by the railroad to the detriment of the general public.

The energy is billed to the railway on two separate bases—maximum demand and kilowatt-hour consumption. The maximum demand is controlled by a power indicating and limiting system that will prevent the total combined demand of the five substations from exceeding a predetermined limit. A minimum annual kilowatt-hour consumption clause also is included in the contract.

Power is transmitted three-phase at 50 cycles. From the Maitenes generating station through the San Cristobal receiving station at Santiago to Valparaiso, approximately 125 miles, there is a duplicate 110,000-volt transmission line. The San Cristobal station and the railway substations also may receive power in emergencies from the Santiago city system, which is fed by the Florida and Mapocho stations.

From the San Cristobal receiving station a twin-circuit three-phase, 12,000-volt line supplies the Quilicura (No. 5) substation. At Las Vegas the power company has installed a transformer station which steps down from 110,000 to 44,000 volts for distribution to the railway substations at San Pedro, Llai Llai, and Rungue (Nos. 2, 3 and 4) by means of separate duplicate lines to each station. These lines are also used for supplying other power customers. At Miraflores, near Valparaiso, another transformation down to 12,000 volts is made for the line supplying Vina del Mar substation (No. 1) and the city of Valparaiso. All of these lines have been duplicated so as to permit repairs to be made without shutting down the stations, and also giving a greater factor of reliability.

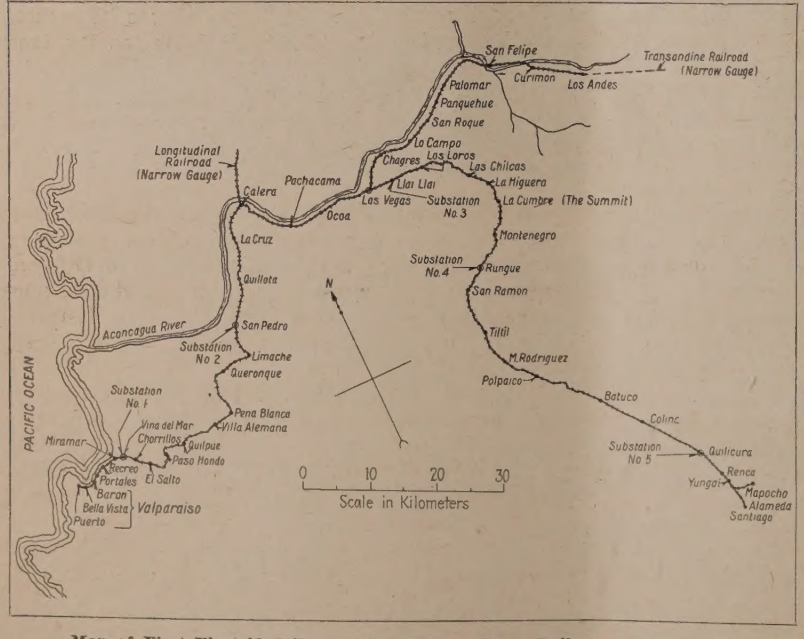
Energy Is Transformed in Five 4,000-Kw. Substations

Energy for railway operation is converted from high-tension alternating current to 3,000-volt direct current in five 4,000-kw. substations, each of which is equipped with two 2,000-kw. synchronous motor-generator sets.

The substation buildings are of reinforced concrete with reinforced concrete roofs. Windows on all sides provide natural lighting in the machine and transformer rooms. The blowers for the motor-generator sets, the starting and running circuit breakers, station service transformers and breakers and the flash suppressors are located in the basement. Space also is provided beneath the transformers for oil tanks in which to store the oil when it is drawn off from the transformer cases. The machine rooms of all the stations are identical, and have been designed to accommodate a third motor-generator set, which will be installed when it is necessary to provide for increased traffic. A traveling crane for handling the motor-generator and switch-gear parts spans the room.

The transformers are housed in a separate room, which is of the same general design as the machine room but is narrower and does not have a traveling crane. The roof trusses of the transformer room, however, are designed with sufficient strength to support chain blocks over the transformers for raising the cores out of the cases, after which the cases may be rolled to one side and the cores lowered to the transformer foundations.

Each motor-generator set is driven by a 2,840-hp., three-phase, 2,300-volt, 50-cycle, 500-r.p.m. synchronous motor on the same shaft with two 1,000-kw., 1,500-volt direct-current generators, one on either side of the motor, and connected in series for 3,000 volts. These machines are shunt-wound compensated generators, with commutating poles. The sets include two exciters, one of which supplies current for the synchronous motor field and the other for the generator fields.



Map of First Electrified Zone of the Chilean State Railways, Showing the Route and Locations of Substations

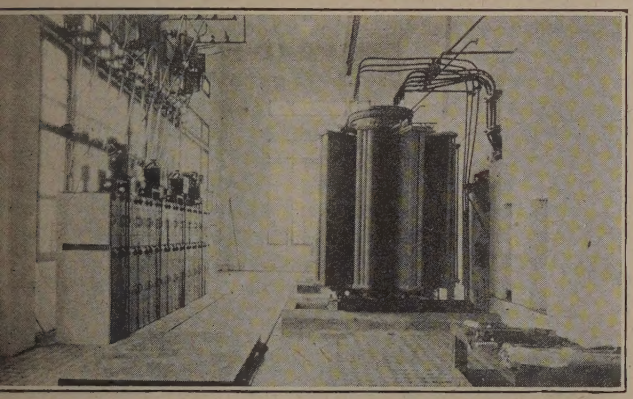
The motor-generator sets are reversible, being able to receive direct current from the contact line when the locomotives are regenerating and convert it to alternating current, which is fed back into the alternating-current transmission line for use elsewhere.

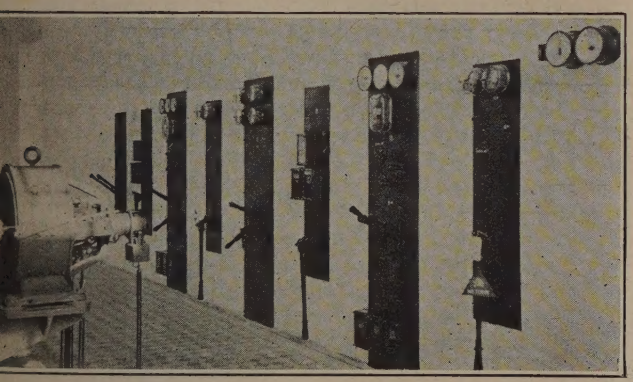
The sets were designed to give successful performance under a wide range of loads, and to withstand severe short circuits on the distribution system. They are rated at 2,000 kw. continuously, followed by 3,000 kw. for two hours without exceeding a temperature rise of 55 deg. C., and can have this followed with 6,000 kw. or 200 per cent overload for 5 minutes without exceeding a safe temperature.

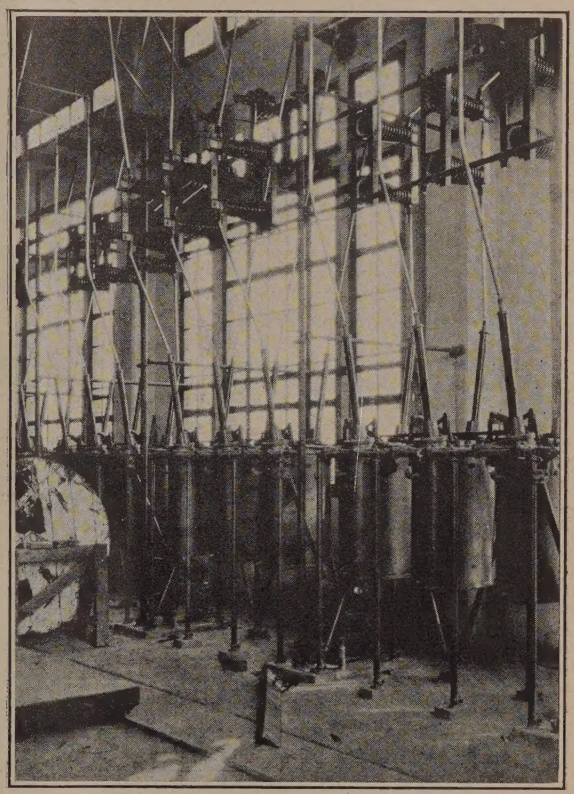
The synchronous motors have sufficient capacity that of compensated windings, distributed across the faces of the main poles.

The voltage characteristics of the generator sets, as determined by oscillograph tests, is shown in one of the accompanying diagrams. Each point on the curve represents a short-circuit test made with one side of the line grounded and the other opened by a low-speed circuit breaker.

Another diagram shows an oscillograph record of a short circuit on the machines. In the test the generators were short-circuited at 3,000 volts with no external resistance other than the necessary cable conductors and circuit breaker. In this test the current reached 13,000 amp., or 20 times full load current.







Some of the High-Tension Substation Apparatus

Above—The main transformers and the 12,000-volt breakers installed in the high-tension room at Quilicura substation.
Below—The 44,000-volt circuit breakers at Llai Llai substation.

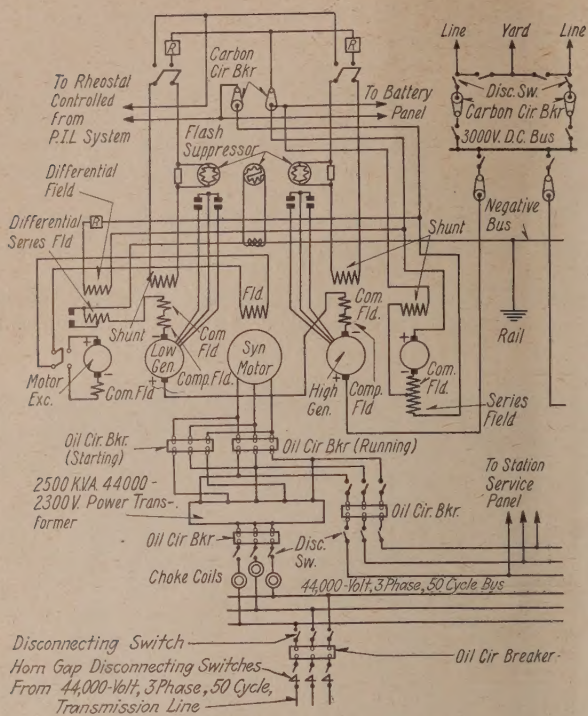
At Right—The panels controlling the transformers, synchronous motors, incoming lines and flash suppressor are mounted in the dividing wall between machine and transformer rooms.

fans are not required, and the fields are of such size that high power factors can be obtained over a wide range of loads. The exciter windings are arranged to give the desired power factor when the machines are operating either as motors or as generators.

The generators are partially inclosed to minimize windage loss and are provided with a separate blower that operates only after a definite temperature of the windings has been reached. The blower is started automatically by means of a resistance coil taped up with a series conductor in such a manner that it maintains approximately the same temperature as the armature. Thus by shutting down the blower on light loads the over-all efficiency of the set is increased.

Since good commutation is essential for high-tension direct-current machinery under the severe conditions of heavy sustained overload occurring in normal operation, every precaution has been taken to assist in obtaining it. One of the important features is the use

Previous experience with this type of equipment showed that it was unnecessary to use extensive flash-guard equipment as a precaution against flashovers. Their omission gives greater accessibility to the commutators. Flash suppressors have improved conditions so remarkably as to make their use very desirable, despite the unusually stable operation of these generators under short circuits. They add reliability to the system as a whole, in that short-circuit currents are not permitted to rise to high values, endangering the condition of the circuit as a whole, including armatures and electrical equipment. The flash suppressor adopted consists of a group of light knife switches mounted on a shaft to which is attached a strong spring held in tension. When the tripping mechanism is operated the switches close at high speed, short-circuiting the generator armature windings on the rear end through three collector rings to which taps are brought out through the armature windings. Trip coils



Schematic Diagram of Connections of One of the Substations, Showing One Incoming Line and One of the Motor-Generator Sets. The Other Set Is Connected in Exactly the Same Manner

energized from the secondaries of through-type transformers operate the tripping mechanism. The transformers in turn are energized by the current rise in the main generator circuit.

THREE-PHASE TRANSFORMERS ARE USED

Each station contains two three-phase, 50-cycle transformers. Two of the stations receive power at 12,000 volts and the other three at 44,000 volts, making necessary the use of main transformers of different voltage in the two groups of substations. All the transformers are rated at 2,500 kva. continuous, followed by 150 per cent load for two hours with a 60-deg. C. rise. Following this load the transformers are capable of withstanding 300 per cent load for 5 minutes.

These transformers all deliver 2,300 volts on the low-tension side, with starting taps giving less than half this voltage. Normal voltage may be delivered to the low-tension side when the transmission line voltage is 10 per cent below normal through a second set of taps on the primary. All the transformers have star-connected primaries and delta-connected secondaries.

The transformers are of the oil-insulated, self-cooling radiator type designed for indoor service. The scarcity of cooling water made this type preferable to the water-cooled type.

Since the railroad has a number of tunnels in the electrified zone with low clearances, it was found desirable to strip the tanks clear for shipment, with the radiators boxed separately.

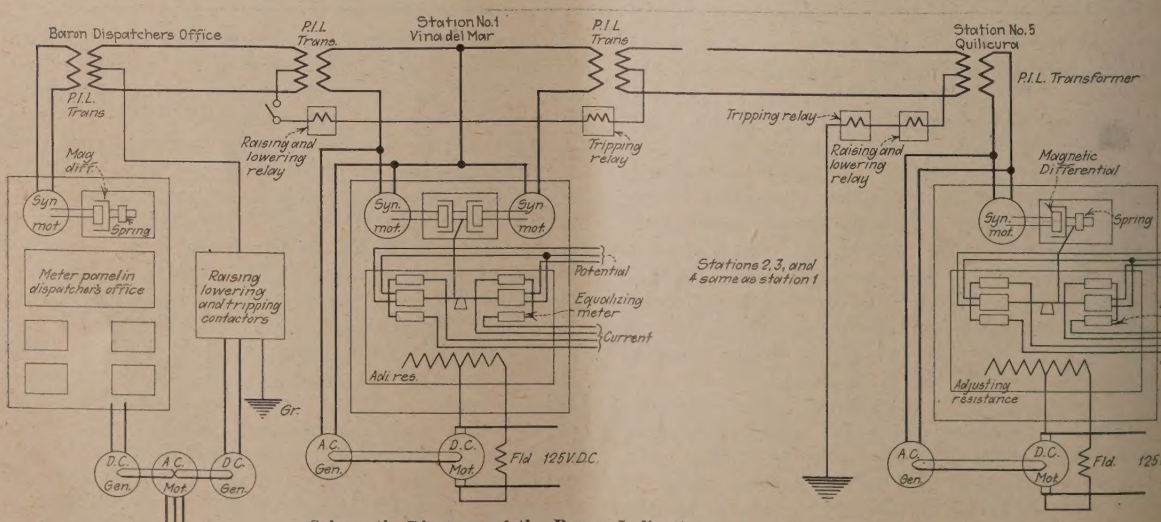
In order to limit the stresses due to short circuits on both the low-tension and the high-tension sides, the arrangement of the transmission system and the transformer stations is such as to introduce a considerable amount of impedance in the circuit, limiting the stresses to conservative values.

Oil storage facilities have been provided by the construction of tanks located underneath the transformers. When making repairs the oil is first drawn off into the storage tank, this arrangement also facilitating the oil filtering. The transformers have been equipped with wheels and a foundation containing tracks, so that the transformer can be rolled out onto a truck. This can be moved the entire length of the high-tension room and outside the building, where tracks are laid.

Horn-gap switches mounted on poles outside the buildings for cutting off power and for isolating one of the duplicate transmission lines when necessary have been provided at all the substations.

In the high-tension room the circuits are controlled by oil circuit breakers between the horn-gap switches and the high-tension bus. Westinghouse type G-1 breakers are used in the 44,000-volt stations and E-6 breakers in the 12,000-volt stations. Similar breakers are used for controlling the transformers on the high-tension side. The 44,000-volt disconnecting switches and breakers are mounted on pipe framework, while the 12,000-volt breakers are arranged for cell mounting and have removable doors. These breakers have remote mechanical control and automatic tripping mechanism.

Feeder switches for sectionalizing the lines at the substations are mounted on each substation roof. These are 2,000-amp., 3,000-volt switches equipped with horns.



Schematic Diagram of the Power Indicating and Limiting System

hey are capable, if necessary, of rupturing the 3,000-lt circuit without the aid of other circuit breakers. At substations Nos. 2 to 5 four of these horn-gap vitches are installed, while at substation No. 1 (Vina l Mar) nine switches were required to sectionalize e distribution system properly. Stations 2 to 5 are cated along single track, while No. 1 is located along ouble track. The horn-gap switches facilitate train ovement in case of emergency due to failure of the verhead construction between substations, as the defec-ve section can be isolated and trains from the opposing rection set in on side tracks energized from the sec-on which is in good operating condition. The yard verhead construction is insulated from the main line nd is fed, in the case of stations located on single rack, from either feeder breaker. This arrangement ermits the passage of the maintenance equipment ithout delay. On the double-track sections the yard n be fed from any feeder.

In the case of trouble within the substation buildings fecting the 3,000-volt cables, these switches can be sed to cut off the power entirely from the building, nd the contact line can be fed past the substation ithout the current entering the building. The rrangements at the Vina del Mar station are shown in he of the accompanying diagrams. The operating vers are located back of the main switchboard, and are onnected to the switches by vertical rods passing rough the roof.

Lightning conditions in the Valparaiso-Santiago dis-rict are not at all severe, but the occasional discharges etween clouds and earth are cared for by the installa-on of type AL aluminum lightning arresters with mpulse gaps in both the 44,000-volt and 12,000-volt ations. The arresters are located in the high-tension oom near the circuit breakers and tap onto the high-nsion busbars.

Control Equipment for the Sets and Station Service

The starting and running breakers for the 2,840-hp. nchronous motors are in the basement under the achine room. They are controlled from the motor anel directly above, and are mounted in the dividing all between the machine room and the transformer oom. In the illustration of the switchboard, the first anel at the right is for the control of the transformer reakers, the second is for the control of one of the nchronous motors and the third for one of the coming high-tension lines. The fourth panel controls he 2,300-volt breakers in the circuit for station service. he last panel on the left carries the handles for esetting the flash suppressors.

The station is supplied with low-tension current rough a 37½-kva., 2,300 to 220-volt, three-phase trans-rmer, which receives power from the secondaries f either of the two main transformers. This 220-volt ower is controlled through a panel in the switchboard nder the balcony, which contains the three-pole knife witches for the station service, comprising blower motors r ventilating the main motor-generator sets, station ghting, compressors for blowing out equipment, oil esting, filtering and drying equipment, and for the ower indicating and limiting equipment of the motor-enerators.

The main switchboard for the generators and out-oing d.c. feeders is divided into two sections, that r the instruments and generator control being on the ain floor at one end of the machine room, while

Panel and 3,000-Volt D.C. Circuit Breaker Located on Balcony

the section containing the circuit breakers and disconnecting switches for control of the 3,000-volt circuits is on the balcony directly above the control and instrument section.

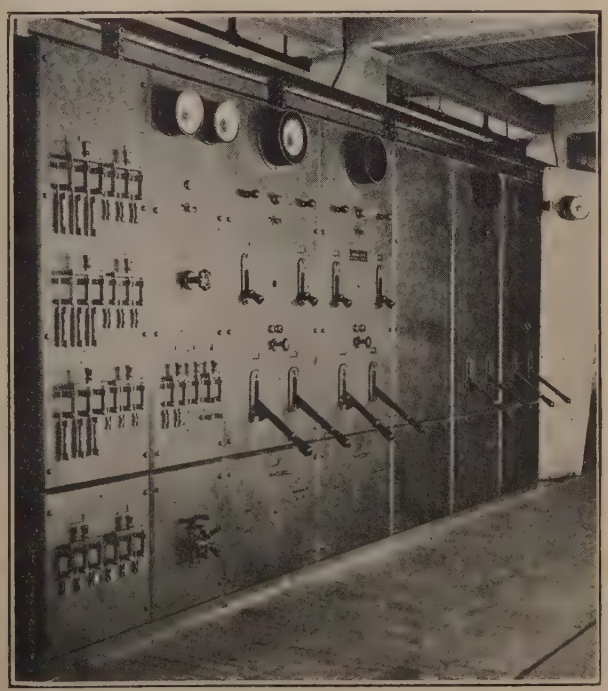
The breakers and switches are so placed that failure of any part of the high-tension circuit would cause minimum damage, the circuit breakers being mounted on the front balcony panels and the disconnecting switches on the rear panels and separated from the breaker panels by barriers. Breakers and disconnecting switches are arranged for mechanical operation from the control board. The meters are mounted on a Bakelite disk within a Bakelite case with a plateglass front, affording a clear view of the indicating dials with safety.

The generator panels carry the control handles for the main and exciter circuits, including field rheostats for the main generators and their exciters.

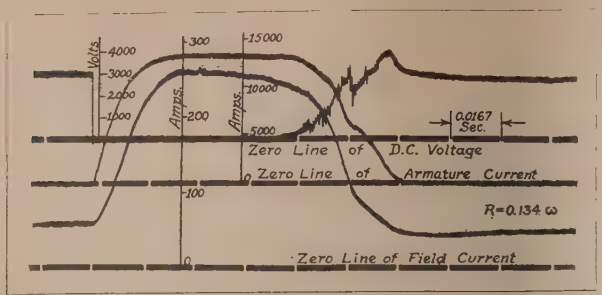
The feeder panels in stations Nos. 2 to 5 control the feeder breakers and disconnecting switches inside the building, while provision for additional protection and flexibility is obtained by placing yard feeder switches on the substation roof. Substation No. 1 has four feeder panels because of the double track.

All the generator and feeder circuit breakers are provided with unusually powerful magnetic blowouts and large arc chutes, although the duty of these breakers under short-circuit conditions is made easier by the flash suppressors.

The generator negative leads pass through transformers and tap onto a negative bus attached to the



The Control and Instrument Sections of the Main Switchboard



Oscillogram of Short-Circuit Tests at 3,000 Volts. The Current Reached 20 Times Normal Without Bucking Over

track rails. The secondaries of these transformers are connected to the trip coils of the flash suppressors, which act upon sudden increase of current due to short circuits or grounds on the d.c. system. These flash suppressors are located in the basement. They are reset from a panel in the wall between the machine and transformer rooms. When the flash suppressor is reset the generator field switch closes automatically.

Lightning protection on the d.c. system is provided by a Westinghouse type A electrolytic arrester in the feeders at each station. These are the only arresters on the 3,000-volt system.

The control system for operation of relays, circuit-breaker trips, indicating lamps, klaxons, etc., is 32 volts d.c., supplied by a storage battery. An automatic two-pole double-throw switch connects the station emergency lamps to the battery in case of failure of power on the station service board.

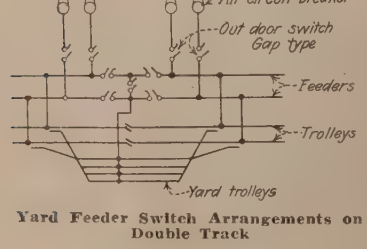
Each station contains a National Brake & Electric portable compressor driven by a 220-volt, three-phase motor for blowing out the machine windings and for other purposes. This has a capacity of 16½ cu.ft. per minute.

A 3-kva., 30,000-volt induction-regulator type oil-testing unit takes power from the station service panel at 220 volts. To provide for drying out the main transformers after installation or repair a special transformer drying outfit was designed. It consists of a bank of grids receiving 220-volt, three-phase power for heating air that is forced through the transformer being dried out by a motor-driven blower.

The oil in the breaker tanks may be reconditioned to regain its insulating properties by means of a Westinghouse type A-30 drying oven.

The Power Indicating and Limiting System Is Unique

Due to the type of hydro system employed, it is impracticable to provide storage capacity near the Maitenes or the Florida generating station. The power contract is based on energy used in kilowatt-hours, and also on the maximum demand in kilowatts. The maximum demand is defined as the highest reading during any 15 consecutive minutes. Although the contract does not set a limit to the power that may be taken by the railroad, a special power indicating and limiting system has been designed and installed for lowering the demand by reducing the trolley voltage at the peak.



Yard Feeder Switch Arrangements on Double Track

The long duration of the peak period specified is favorable to the railroad, in that there is little danger of serious penalization of schedules due to the operation of this device. Its greatest use probably will be that of totalizing the power taken by all five substations and indicating it in the dispatcher's office at Baron. The permanent chart drawn by graphic meter serves to determine the maximum demand factor for calculating this portion of the bill.

For the contemplated service it is interesting to note that calculations have indicated the following demand figures, the load factors being based on a calculated average load for the system of 4,800 kw.:

Length of Maximum Demand Period, Minutes	Calculated Maximum Demand for Period, Kw.	Load Factor per Cent
2	13,500	35.5
10	11,550	41.5
15	10,150	47.3

The principle of operation of the power indicating and limiting system is quite complicated, although the operation is entirely automatic and it is not liable to derangement. The basic instrument is a Kelvin balance type contact-making wattmeter, arranged to measure accurately the total power supplied. One of these is installed in each substation. At the Quilicura substation, No. 5, is located a 2-kva. motor-generator set consisting of an alternating-current generator driven by an adjustable speed direct-current motor, whose speed is controlled by the contact-making wattmeter. With no load on the substation this speed is set to give 25 cycles on the generator. The direct current for operating this set is obtained from another motor-generator set fed from the a.c. station service bus.

The variable-speed d.c.-a.c. set drives a small synchronous motor that operates a magnetic torsion device connected mechanically to the beam of the wattmeter, the equipment being combined to produce an alternating frequency varying with the power input to the station in such a way that the excess frequency above 25 cycles is proportional to the power input to the station.

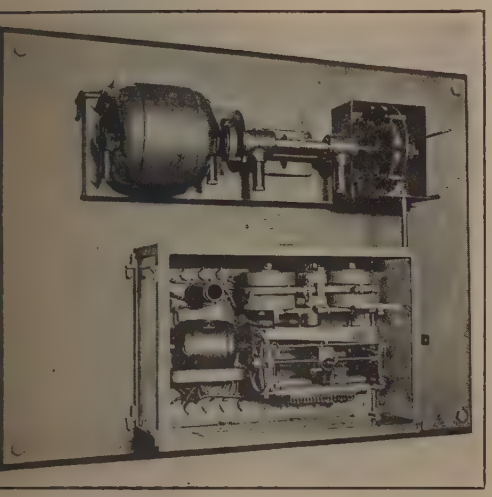
An electromotive force carrying this variable frequency is transmitted at approximately 2,200 volts over two aluminum conductors carried on cross-arms on the trolley poles to substation No. 4, at Rungue, where there is a similar equipment to that at Quilicura, except that instead of a single small synchronous motor operating in conjunction with the wattmeter there are two synchronous motors with magnetic torsion devices, one driven by power from No. 5 substation and the other receiving power from the variable-speed motor-generator in No. 4 substation.

This equipment is so arranged that the speed of the motor-generator produces a frequency equivalent to that transmitted from substation No. 5, augmented by an amount proportional to the power input to substation No. 4, the new frequency thus being equivalent to an amount in excess of 25 cycles proportional to the sum of the power inputs to the two substations combined.

The new frequency is then transmitted on to No. 3 substation at Llai Llai, where there is similar equip-

ent, increasing the frequency by an amount proportional to the power input at that station, then to No. 2 San Pedro and to No. 1 at Vina del Mar, from where e total power indication, expressed in frequency, is ially transmitted to the dispatcher's office at Baron Valparaiso.

At the load dispatcher's office the variable-frequency ternating current drives a small synchronous motor tuating a magnetic torsion device, which is connected

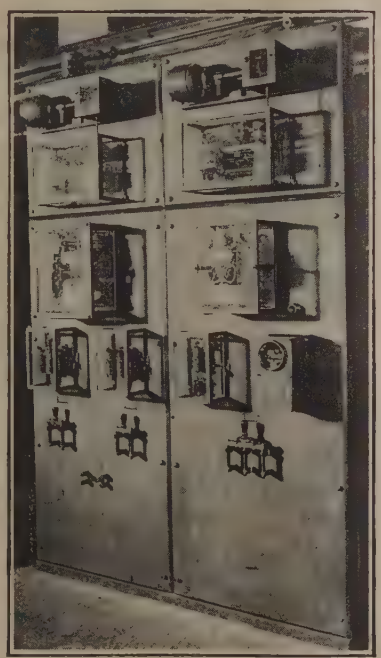


echanically to a contact-aking wattmeter similar to at in Substation No. 5. This attmeter receives power rom a local source, and is rovided with a means of auto-atically adjusting the amount power supplied to it proportionally to the excess over 25 cles; that is, to the total power put to all the substations.

In series with the contact-aking wattmeter are a raphic wattmeter and a combined watt-hour meter, and aximum demand meter easuring the integrated nergy consumption as well as ne maximum integrated demand over a period of 15 inutes. There is also a aximum demand limit meter.

Control of the power demand is accomplished through combination of relays in ne load dispatcher's office arranged that when a predetermined load is reached series of impulses is sent out over the power indicating and limiting circuits, which actuate relays in the arious substations to control the generator field rheostats and lower the trolley voltage sufficiently to maintain ne load within the required limit. As the power demand decreases the trolley voltage is restored to normal.

The impulses are transmitted from station to station y direct current carried through the middle taps on the ransformers. This direct current is supplied from ne motor-generator set in the dispatcher's office, which s fed directly from the power company's system. A apid rise in power peak exceeding the setting desired,

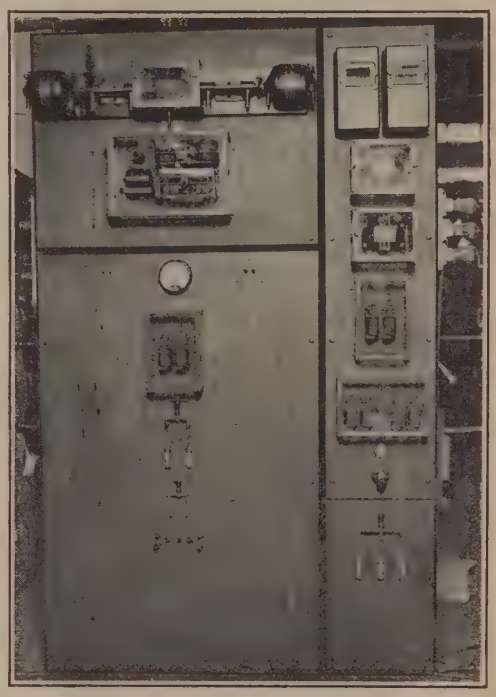


The Power Demand Integrating Mechanism

At left, end station panel of power indicating system at Quilicura.

At right, equalizer panel for intermediate stations in power indicating system.

Below, control panels in dispatcher's office at Baron.



and which would be beyond the limit of control of voltage on the motor-generator sets, is avoided by transmitting a higher current through the circuit. This trips the circuit breakers and takes the stations off the line.

When power is returned to the line by regenerative braking this is credited by the meters, so that the measurements represent the net power being delivered to the substations. On this electrification the maximum spacing of stations is 31 miles on a section of relatively light traffic and easy gradients, while the shortest section, 20 miles long, has the heaviest grades in the entire engine division. The densest traffic is on the Valparaiso end of the line, between Puerto and El Salto, in which a number of suburban trains are run in addition to the through trains. The next most important section is that between El Salto, Las Vegas and Llai Llai. A number of passenger trains are run to the latter station from Valparaiso and others from there to Los Andes. Several freight trains cover this section, and are diverted to the Los Andes branch at Las Vegas. The section of the line between Llai Llai and Santiago has the most severe gradients, reaching the maximum elevation of approximately 2,600 ft. above sea level, but the number of trains is smaller.

Substation No. 1, Vina del Mar, will be quite heavily loaded, and requires the two 2,000-kw. motor-generators now installed to handle the initial installation. Station No. 3, at Llai Llai, will be the heaviest loaded station of the five, since it will supply energy to the locomotives hauling trains up the heavy grade section to the summit of the mountain, and also will supply energy to the Los Andes branch and northward toward substation No. 2. Two motor-generator sets will be sufficient for a limited time, and increased traffic will require the installation of a third set.

The 2,000-Amp., 3,000-Volt Yard Feeder Switches Are Mounted on the Roof of the Substation Building

Stations 2, 4 and 5, at San Pedro, Rungue and Quilicura, did not from capacity requirements need two 2,000-kw. motor-generator sets, but from the standpoint of reliability two were installed at the request of the railroad. Quilicura is the end station, and classification yards at Yungai receive their energy from this station. When the electrification is extended southward past Santiago, this station will serve to feed a considerable section of the new installation.

The substation spacings and layouts were selected to provide for an increase in the traffic to approximately 2¼ times that which existed in 1921. Each building has provisions for the installation of a third motor-generator set when needed.

The feeders, like the substations, were arranged to handle traffic 50 per cent greater than that in 1921. All aluminum feeders were used, largely on account of its lower cost at the time the equipment was purchased, and steel-reinforced aluminum conductor was found unnecessary on account of the small stresses. The feeder used is a 795,000 circ.mil, which is equivalent to 500,000 circ.mil of copper. On the Los Andes branch two 596,000 circ.mil feeders are used, each of which is equivalent to approximately 375,000 circ.mil of copper.

On the heavy traffic sections from the summit of the mountain northward the drop was limited to a maximum of approximately 350 volts. Eastward from the summit toward Santiago the maximum drop may run occasionally as high as 550 volts, but this will be exceptional, even with traffic 50 per cent in excess of that figured on. The lowest potential probably occur on the Los Andes branch, but the traffic th is very light and there is ample leeway in the schedu The drop can be reduced when the traffic warrants running a short-cut feeder across the mountain fr Rungue or in several other ways. The feeder capac between the summit at La Cumbre and Llai Llai such as to limit the drop on motoring to 350 volts a the voltage rise on regeneration to between 250 and volts. These values are, of course, calculated and n vary somewhat in operation.

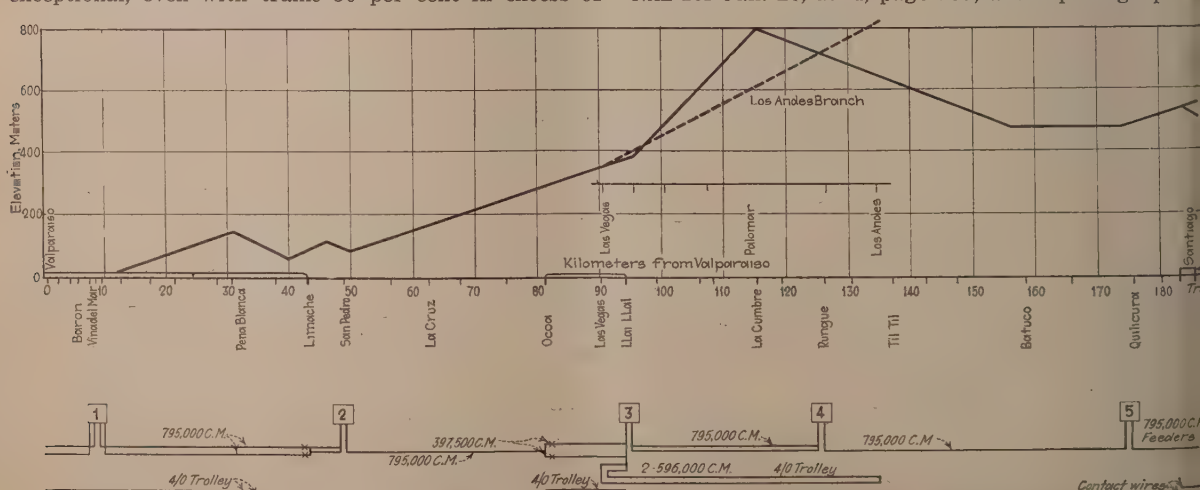
A single No. 0000 copper trolley wire is strung o each main track, while in the yard the size was redu to No. 00 copper trolley. Between the feeders a the trolley there is sufficient current capacity that a substation may be shut down while continuing to op ate trains, although, of course, they would oper at reduced speed in the vicinity of the station out service.

The electrical equipment for the substations, with exception of a few minor items, was manufactured the Westinghouse Electric & Manufacturing Compa and was installed under the direction of that compan engineers. The buildings were constructed by Errazu Simpson & Company.

Details of New Pennsylvania Electric Locomotives

Additional Information on 200-Ton Engines Design for Either A.C. or D.C. Operation and for Preference Freight or High-Speed Passenger Service

IN FEBRUARY of this year the Pennsylvania R road completed the first of three similar electric lo motives, one of them for use in either freight or p senger service on 11,000 volts, 25 cycles, alternati current and the other in passenger service on 650 vo direct current. The mechanical parts were desig and built by the Pennsylvania Railroad, and the el trical parts by the Westinghouse Electric & Manuf turing Company. The locomotives were assembled the Juniata shop of the railroad. A description of th locomotives was published in ELECTRIC RAILWAY JO NAL for Jan. 26, 1924, page 133, and a photograph w



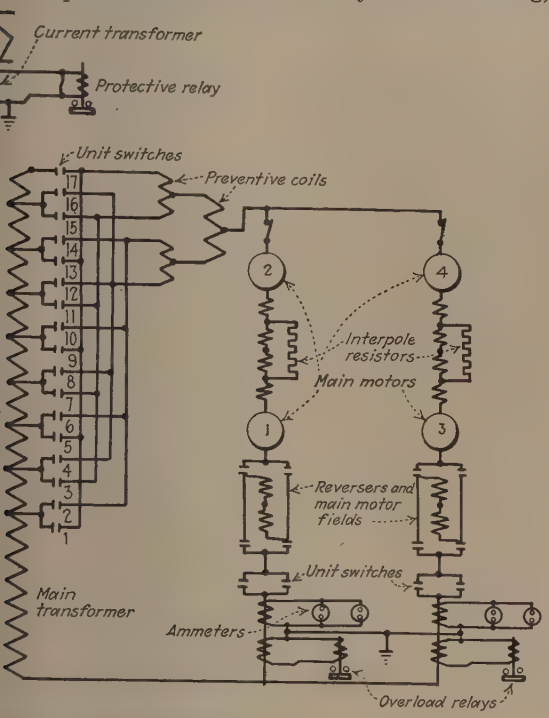
Condensed Profile, Feeder Layout and Substation Location Diagram for the Electrified Section of the Chilean State Railways

ished on Feb. 9, page 218. Further details are now lable and are given below.

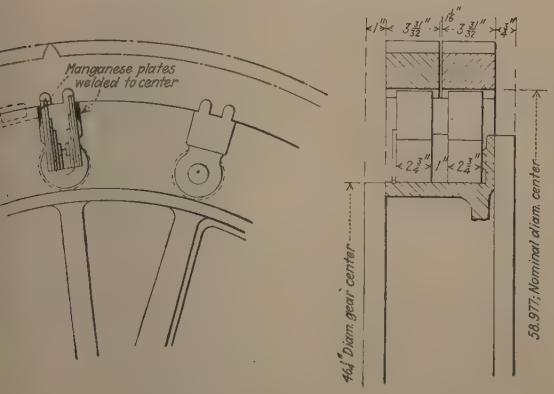
he first locomotive, known as the L-5, was placed in ght pusher service on the 11,000-volt alternating- ent section between Overbrook and Paoli, Pa. A nd, equipped for passenger service at 650 volts ct current, and known as the L-5-A, has just been pleted and will be placed in service at the New York inal.

ach locomotive weighs 408,600 lb. total, of which 600 is on drivers, and is equipped with four West- louse type 418 single-phase commutator motors. of these motors are geared to a jackshaft, which onnected to two pairs of drivers through the side . The two center drivers are flangeless.

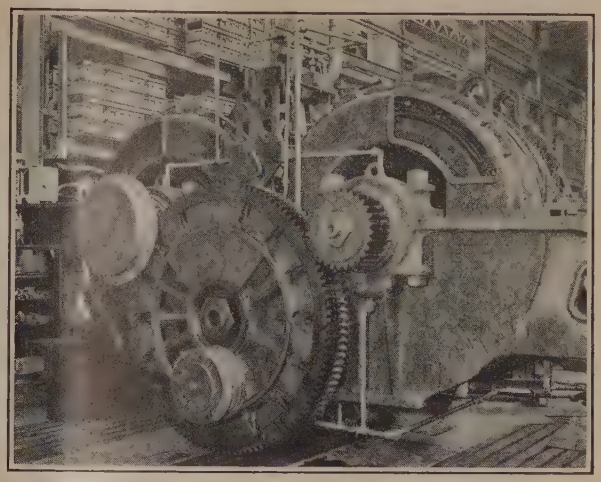
ubrication of motor and jackshaft bearings is ob- ed by an oil circulation system. Under each jack- t, cast integrally in the main frame, is an oil reser- holding an adequate supply of oil. Geared to the shaft is a plunger type pump which, when the loco- ve is running, pumps the oil from the reservoir to stributing manifold. From this point, the oil flows r low pressure to each motor and jackshaft bearing,



matic Control Diagram for New Pennsylvania Locomotive



Details of Flexible Gear of Pennsylvania Locomotive



Motor and Gear of the Pennsylvania Locomotive Assembled for Testing

and thence back to the reservoir. An indicator, consisting of a sight feed valve, is located in each operating cab.

The guiding trucks on each end of the locomotive are of the radial center-bearing type equalized with the main drivers through bell cranks and tension rods. Flexibility is obtained between the truck and bearing plate by means of transverse flat leaf springs resting in the swing links supporting the weight on the truck.

Each jackshaft is equipped with two sets of flexible gears, one set on each end of the shaft. A set of gears consists of a cast steel gear center carrying the side rod pin, two heat-treated gear rims and a number of flat spring flexible units interposed between the gear rims and the center as shown in an accompanying drawing.

The motors each carry two pinions meshing with the gears, the pinion on the motors nearest the center of the locomotive being solid and those on the outer motors being flexible. The flexible pinions are similar in construction to the gears, using duplicate flexible elements.

THE L-5 GEARED FOR A.C. FREIGHT SERVICE

	Amp. per Motor	Brake Hp.	Tractive Effort, Lb.	Speed M.p.h.
At maximum tractive effort...	4,250	3,450	100,000	12.5
At one hour rating.....	2,600	3,300	59,000	21
At continuous rating.....	2,300	3,070	50,000	23
THE L-5 GEARED FOR D.C. PASSENGER SERVICE				
At maximum tractive effort...	4,250	3,450	54,000	22
At one hour rating.....	2,600	3,300	29,500	42
At continuous rating.....	2,300	3,070	25,000	46

The traction motors are of the interpole type and the excitation of the interpole fields is adjusted by suitable resistance shunted across the interpole winding. The main circuits of the alternating-current locomotive are shown in the accompanying diagram.

The air brake equipment is the type 14-EL., an adaptation of the No. 6-E.T. to electric locomotives. Compressed air is furnished by a single compressor having a capacity of 150 cu.ft. of free air per minute when operating against a pressure of 140 lb. per square inch.

Energy for control and lights is obtained from a 30-volt storage battery, which is charged from a small motor-generator set consisting of an alternating-current single-phase motor and direct-current generator.

The ratings of the L-5 locomotive geared for both passenger and freight service are given in the accompanying table.

Toronto Shop Has 5 Acres Under One Roof

This Building, the Principal One of the Group Recently Completed by the Toronto Transportation Commission, Was Designed so as to Involve the Minimum Movement of Materials, Equipment and Men—The Arrangements Provide for About 1,800 Cars, Including All Departments Necessary for Overhauling and Painting

THE car repair shop of the Toronto Transportation Commission is the largest one of the group of buildings at the Hillcrest Yard, recently built as a part of the rehabilitation program that has followed the operation of the property by the municipality. A preliminary article on this shop was published in the ELECTRIC RAILWAY JOURNAL for April 28, 1923, page 723, and a general description of the entire group of buildings was published in the May 24, 1924, issue, page 801.

When the commission took over the property of the old Toronto Railway, the shops and equipment were found entirely inadequate for the work they had to do. The condition was such that, with the purchase of new cars and with increased service, a new shop with modern facilities was essential. Accordingly plans for the present shop were begun as soon as the final steps were taken to acquire the railway. The entire layout, based on a system operating 1,800 cars, has been planned to obtain efficiency in repair work and conserve movements, both of the cars and parts under repair and of the men engaged on the work.

The main shop is a single building 452 ft. 2 in. long and 466 ft. 10 in. wide, divided in the middle by a transfer table which traverses the entire width of the building. The transfer table occupies a space 50 ft. x 566 ft., including a 50-ft. extension at each side of the building. This makes a total area under one roof of slightly more than 218,000 sq.ft. The useful floor area of the building is 181,790 sq.ft. or about 4 acres.

The building is designed and laid out as a complete unit, embracing under the one roof all the separate departments engaged in car repair work. For the most part it is a clear open space. Only the paint section, the "free stores," the forge shop and a lunch room for the men are partitioned off. This arrangement was decided on as permitting intimate association, promoting co-operation, and tending to stimulate good work among the employees. On account of the rather severe winters in Toronto it is particularly desirable to have the work concentrated in this manner, as with it there is no necessity for the men to go outdoors for any purpose in connection with their regular work.

One of the particular features of this building is the good natural lighting, which is obtained through the use of skylights in the roofs. These are of the familiar saw-tooth variety, with the glazed portions facing the north. By this means a diffused light is available, which is reflected from the white ceilings to the working floor below. This natural lighting is sufficiently uniform that no shadows are cast by objects or workmen on the floor of the shop. In addition to the skylights, fully half of the side walls are of glass. The light is sufficient for accurate work even on dull days, as is evidenced by the interior photographs illustrating this article, most of which were taken on a cloudy day.

The shop building is heated with a hot-air system. Steam from the main heating plant is passed through coils within an air chamber located in the basement near the southwest corner of the building. From here it is forced by a fan through a system of ducts reaching every portion of the shops, except the paint shop where direct steam heat is used in order to minimize dust and facilitate drying. Outlets from the hot-air ducts are provided at frequent points so that the shop is kept at a uniform temperature.

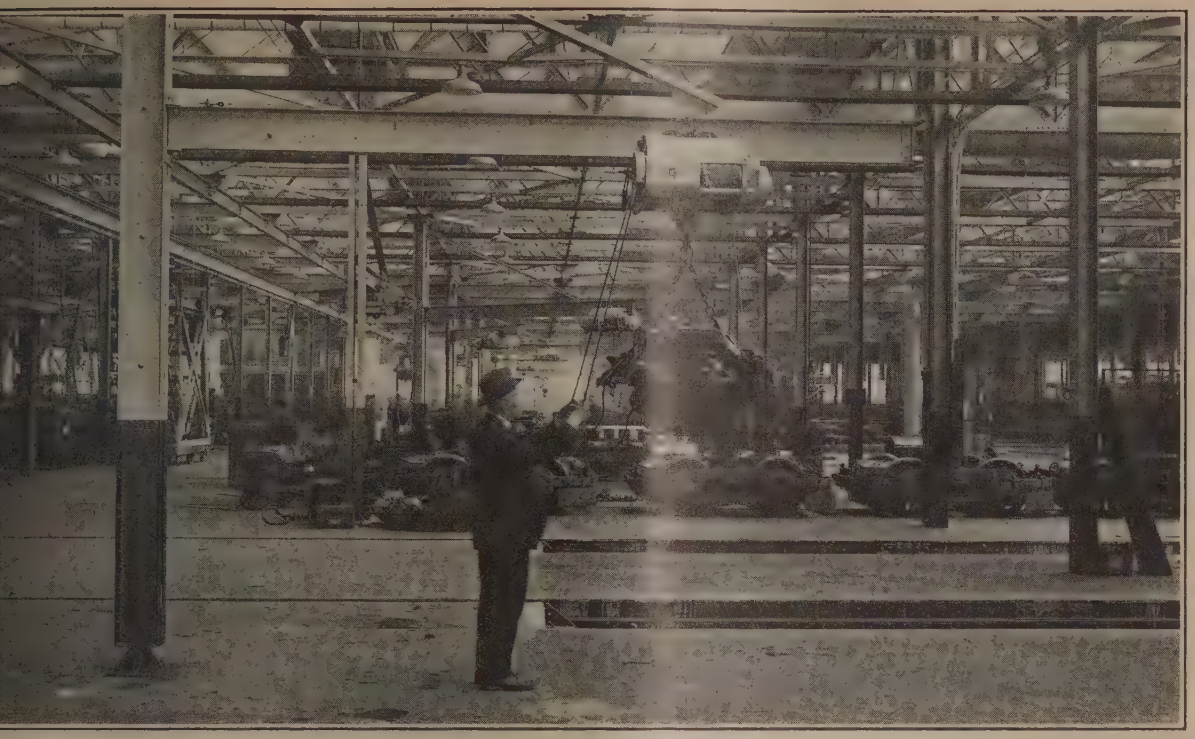
THE TRUCK SHOP HAS SPACE FOR 29 CARS

The truck shop occupies the space directly south of the transfer table. It is 100 ft. wide and the full length of the building, with 29 tracks, each of which has ample capacity for handling a car. Four tracks at each end of the building, or eight in all, are equipped with car hoists. The tracks at either end of the shop are fitted with a wheel grinder.

All of these tracks are connected with the machine shop, armature shop, forge shop and the free stores by means of an overhead monorail system which is used for the handling of heavy parts such as wheels and axles.

Panoramic View of Toronto Shops

The view on these facing pages, taken before the shops were occupied, shows in general the layout of the building. The storeroom and forge shops are behind the partition at the extreme left. To their right is the main truck and motor shop, with the car body shop and woodworking department in the background beyond the transfer way. Further to the right in the background is the paint shop, and at the extreme right are the machine shop and winding room.



Looking West in the Truck Shop. One of the 14 Jib Cranes Is Shown in the Foreground

ors, etc. A 5-ton Shepherd electric crane, shown in accompanying illustration, is used on the monorail em.

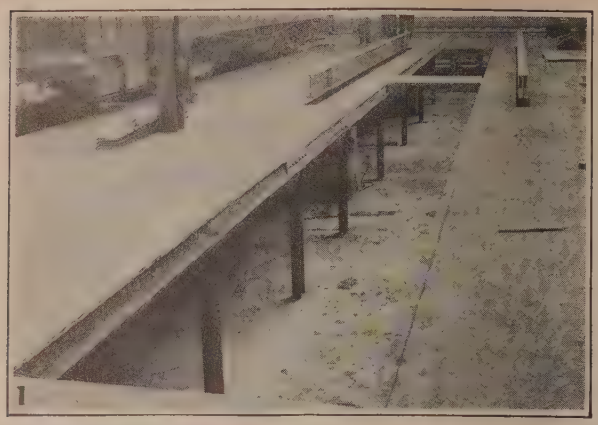
n individual jib crane is provided between each two ks in the truck shop. In this department and in machine shop there are in all 14 of these jib cranes ½-ton capacity and one of 1-ton capacity. Each has adius sufficient to handle trucks and motors on the tracks which it serves, and to place material within h of the main monorail system. Each crane is pped with an electric hoist.

oose dirt is removed from the motor cases, after are taken out from the trucks, by means of a ial vacuum cleaner. The motor to be cleaned is set he shop floor adjacent to the intake of the vacuum em and a canvas-covered wooden frame placed over overing it completely. Suction is provided by the or-driven vacuum pump shown in one of the accom- ying illustrations, which is mounted on a platform e the floor. With the motor in position the nozzle a hose connected to the shop air line is inserted ugh a hole in the canvas cover, and the air pressure urned on. This nozzle is moved around within the case, and all loose dirt is blown off the motor, the dust being carried through the suction line into the receptacle of the cleaner on the platform, where it is deposited. Thus all the dirt is confined, and the operation can be conducted in the shop without interfering with other operations.

The winding room, machine shop, forge shop and free stores are all located adjacent to and separated by a 6-ft. aisle from the motor and truck shop. This layout is such as to compel the shortest possible movement by truck or monorail of material to and from the various production departments to the motor and truck shops, which is the point of demand for such material.

THE FORGE SHOP

The forge shop is located in the southwest corner of the main building, adjacent to the free stores, to which the bulk of the material produced is delivered. Another reason for this location of the forge shop was to keep dust and dirt as far away as possible from the electrical and mechanical work. This location also permits the unloading of fuel oil used in heating the furnaces, the bulldozer, etc., by gravity direct from the steam railroad



No. 1. The pits are of open construction, forming a shallow basement under the entire truck shop. The car hoists of the type shown beside this pit are placed on eight tracks.

No. 2. The forge shop has excellent facilities for car repair work.

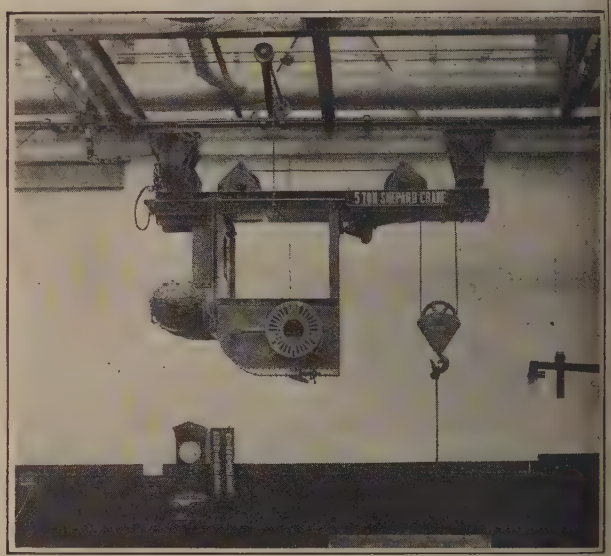
No. 3. The armature winding department.

No. 4. The controller and air-brake sections are adjacent to the winding room and the machine shop.

track at the west of the shop into an underground storage tank.

Forge coal is stored in a basement beneath the free stores, which keeps it dry and in good condition and also obviates the necessity of the helpers going to a outside storage, which wastes time and is dangerous to health in winter.

The eight forges are of the down-draft type. Air pressure for the fires is delivered through a glazed tile pipe which is laid in the exhaust tunnel. There are two direct-connected, air-operated forging hammers, one of 800-lb. and one of 160-lb. capacity. Two gas-fired heating furnaces, one 36 x 36 in. and one 36 x 72 in., and one large-sized electrical heat-treating furnace are installed. The electric furnace is equipped with necessary instruments and apparatus to provide automatic heat control. In addition to this equipment there are large and medium-sized, direct-connected, motor-driven punches and shears, a bulldozer, an emery grinder, an oil furnace, a hardening furnace and a spring furnace. Space



The Monorail System, Which Serves the Truck and Machine Shops, Is Equipped with a 5-Ton Crane

has been provided for a forging machine and a furnace which may be installed later. The electric babbitt-melting furnace and the gas furnace for melting out babbitt from bearings are also located in the blacksmith shop.

The electric and acetylene welding equipment are in the southeast corner of the forge shop, screened to prevent glare. Space also has been provided here for the manufacture and repair of fenders and lifeguards.

Material Is Controlled Through the Free Stores Department

Located between the blacksmith shop and the machine shop is the "free stores," in which are stored and through which pass all incoming and outgoing car parts for repair and also those already repaired. This department is really a clearing house between the divisional carhouse shops and other departments sending material to be repaired and the main repair shop. The duties of this department are to account for all materials received for repair from the carhouse or from other departments of the commission. One of the duties of the storekeeper is to inspect all materials, including

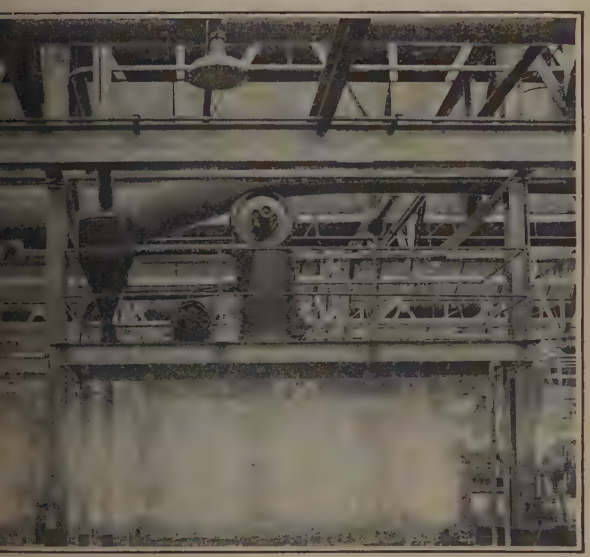
scrap, to decide whether it can be repaired or reclaimed, and whether materials such as brakeshoes have been worn to the fullest extent.

The oil reclamation and oil and waste soakage room is located in a section of the free stores.

The machine shop is located between the winding room and the free stores. A general foreman's office, sub-storeroom and toolroom are placed in the center of this space.

The various machines and their locations in the shop are shown in the diagram. A horizontal boring mill and a planer are located on the main aisle dividing the motor and truck shop from the machine shop, so that motors and truck frames need only be swung across the aisle from one department to the other. A new turret lathe for axle bearings and trolley wheels has been installed. It is anticipated that this tool will do the work of three ordinary lathes.

A group consisting of a heavy four-spindle drill and four lathes of various sizes is installed near the main



By the Use of the Vacuum Cleaner, Motors May Be Freed from Loose Dirt Without Causing Dust in the Shop

aisle. These machines, which are all new and modern, are designed for high-speed steel and quick change devices for variable speeds and feed. It is estimated that these machines will save at least 40 per cent over the obsolete type of lathes in the old shop, so that for the same amount of work only 60 per cent as many lathes were installed here.

The wheel-fitting department directly adjoins the free stores, because the heaviest and greatest quantity of material passes between these departments. In this department are an axle lathe, a wheel borer, a wheel press and a tool grinder. Space is provided for a steel wheel turning lathe should it be decided at any time later to use steel wheels instead of the cast-iron wheels with which all the Toronto cars are equipped.

Equipment of the Winding Department

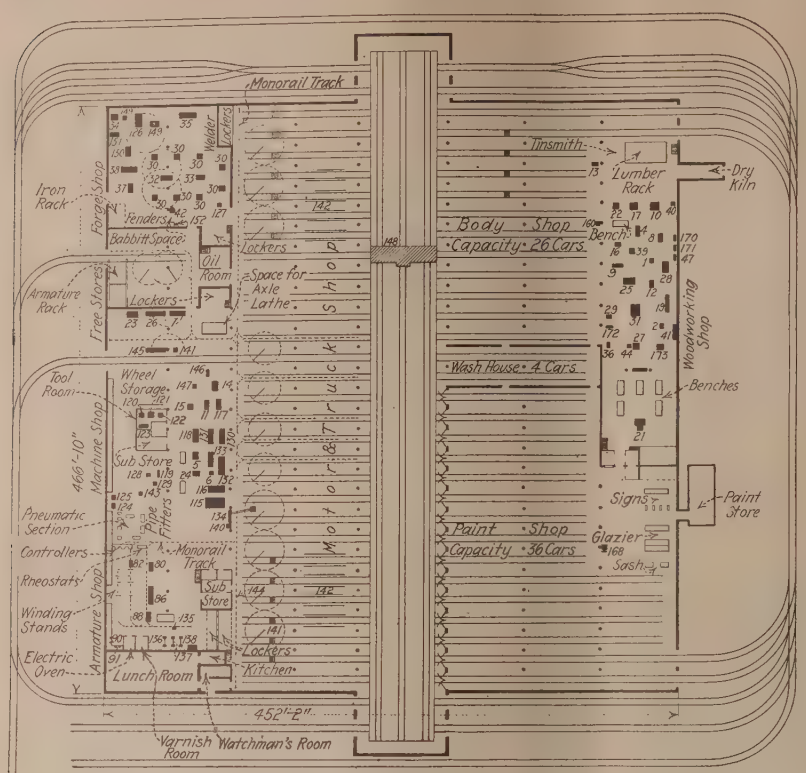
The armature department is located in the southeast corner of the building and without a dividing partition, although it is partially separated by lockers and sub-storerooms. It is provided with 10 armature winding racks, three coil-winding machines, two coil-taping machines and two coil presses. There also is a small wind-

No. 1. The wheel press is located adjacent to the storeroom.

No. 2. Transveyor trucks are used for transporting many articles of moderate weight, such as armatures, about the shops.

No. 3. The transfer table separates the machine work from the body and paint shops. The body shop is shown at the left, and the wash room and paint shops, in the background, are inclosed.

No. 4. In the paint shop permanent posts with movable brackets make it easy to adjust the scaffolding.



General Plan of New Toronto Shops and Layout of Principal Machines

Machine Shop
5. Universal milling machine
6. Wet wheel grinder
7. Axle lathe
11. Radial drill
14. Bolt cutter
15. Drill press
18. Shaper
23. Boring mill
24.* Shaper
26. Wheel press
115. Planer
116. Horizontal boring and milling machine.
117.* Four-spindle drill
118.* Turret lathe
119.* Lathe
120.* Tool room grinder
121.* Milling machine
122.* Drill grinder
123.* Tool room lathe
124*, 125.* Combination grinder
128.* Three-spindle drill
130.* 24-in. lathe
131.* 20-in. lathe
132.* 36-in. lathe
133.* 18-in. lathe
134.* Vacuum cleaner
140*, 141.* Wet wheel grinder
143* Power press
145. Wheel press
146.* Bolt cutter
147.* Machine saw

Armature Shop
80. Binding machine
82. Hydraulic press
86. Lathe
88. Commutator slotting machine
90, 90. Coil presses
91, 91. Taping machines
135.* Insulation test
136-7-8.* Coil winders
139.* Stove armature winder

Forge Shop
20. Bolt cutter
30, 30. Forges
32. Large hammer
33. Small hammer
34. Gas furnace
35. Blast fan
37, 38. Punch and shears
42. Melting out furnace
126.* Bulldozer
127.* Wet grinder
149, 149.* Oil furnaces
150.* Roll former
151.* Square shear
152.* Babbitt furnace

Woodworking Shop
1. 36-in. bandsaw
2. Boring machine
4, 9. Jointers
8. Self-feed ripsaw
10. 12x26-in. planer
12, 16. Trimsaws
13. Drill press
17. 8x27-in. planer
28. Molder
19. Belt sander
21. Roller sander
22. Bandsaw
25. Shaper
27. H. C. mortiser
29. Jigsaw
31. Tenoner
36. Dowel machine
39. Sash sticker
40. Swingsaw
41.* Wood turning lathe
44.* Chain mortiser
47.* Knife grinder
160.* Wet wheel grinder
170.* Bandsaw filer
171.* Circular saw filer
172.* Grindstone
173. Disc sander

Paint Shop
168.* Wet wheel grinder

General
148.* Transfer table
141.* Jib cranes
142.* Car hoists
144.* 5-ton monorail
*Indicates new machines

ing machine for armatures for the car heater blowers. A varnish room and an electrically heated baking oven provide for finishing the armatures and a high-tension insulation testing set for testing them. A commutator slotting machine, a hydraulic press for commutators, a lathe for turning commutators and a banding machine complete the equipment in this section.

A sub-storeroom is located to the north of the armature department, where supplies are kept for both the armature and motor and truck departments, being issued as required by the departmental foremen. Offices for the foremen of these departments are located adjacent to this storeroom.

The air-brake and controller sections are located between the armature department and the machine shop, from both of which the repairing and overhauling of controllers and air brakes require material.

For the handling of light and small materials a system of communication by means of transveyor trucks, and a number of platforms for use in connection with them, has been provided. Thus material when unloaded from the supply car or motor truck can be placed on the platforms and tables and conveyed to the various departments for necessary repairs, thus making it possible to keep all materials off the floors, and resulting in a clean, orderly shop, together with considerable saving in time and expense.

A special use of the transveyor trucks is for transportation of armatures. Instead of being laid on the floor, each armature is stored on a rack designed for the purpose, with brackets for supporting the two ends of the shaft. These are of steel angles and straps, making them light but strong. In order to move an armature one of the transveyor trucks is run directly beneath the frame, and by a movement of the handle the truck lifts the frame off the ground so that it may be carried readily anywhere in the shop.

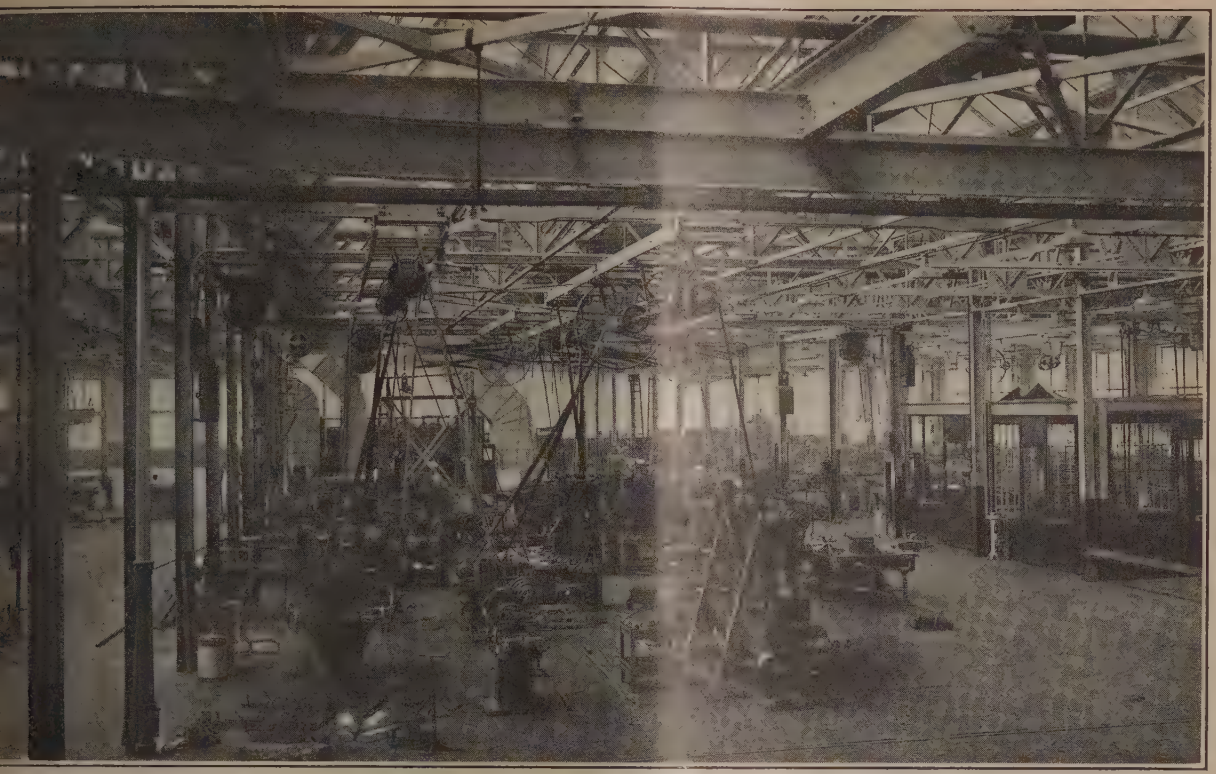
Car Body and Woodworking Shops

The north side of the shop is assigned to car body work, the woodworking mill, the wash house and the paint shop. The car body shop is located directly north of the transfer way, and occupies about 45 per cent of the north portion of the building. There are 14 tracks of two-car length, giving a capacity of 28 cars for body repairs. The tracks in this department are directly in line with those in the motor and truck department, enabling car movements from the truck department, the second step in the progress of the car, to the car body shop by means of the transfer table with the least possible time and effort, and without interfering in any way with the other cars in process of repair.

A car straightener has been built into the floor on one of the tracks in the body shop. The arrangement, which is somewhat different from some other recent straighteners, is shown in accompanying illustrations.

The space north of the body shop is assigned to the woodworking department. This shop is equipped with 23 machines, 18 of which were selected from the 41 in use in the old shop. Four new machines were added because of their greater efficiency. These are a double surfacer, a chain mortiser, a universal woodworking machine and a pattern lathe.

The flooring of this shop is of 2-in. x 4-in. lumber, placed on edge on steel joists, with a top flooring of $\frac{7}{8}$-in. tongued-and-grooved maple. Where the operator



Looking East in the Machine Shop from the Storeroom

tands in front of each machine a slab of mastic floor-ng is installed to keep him from slipping and falling on the machine.

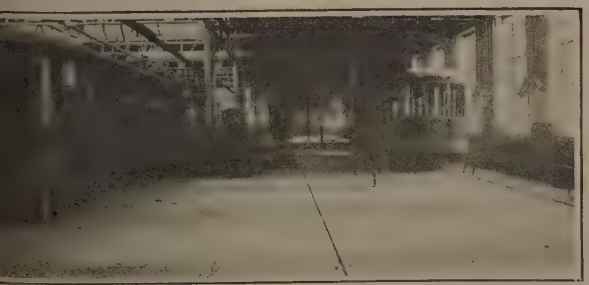
The machines are placed so that the work progresses n regular order from the rough lumber, taken either rom the dry kiln or the lumber rack, through the ma-hines to the cabinet benches and from there direct to he paint shop, adjacent. The wood mill is not walled off from the car body shop n order to insure free novement of material.

There is a basement un-derneath the entire wood hop, and all the motors are nstalled there, directly be-neath the machines they drive. This arrangement rees the wood shop entirely rom overhead belts and haftng, as may be seen rom the illustrations. Each ndividual motor is con-trolled by push buttons located on the machine it drives, placed within convenient reach of the operator.

The basement also provides space for the storage of finished car parts, such as sash, doors, molding, etc.

In the wood shop are two small portable jointing machines and two combination rip and cross-cut saws. These are driven by motors, both machine and motor being mounted on a specially designed frame, which permits of the machine being taken to a job to be done on a car body, such as trimming a window sash, instead of this job having to be carried into the woodworking shop.

All the machines are supplied with factory box trucks, so that the material can be kept off the floor. Where possible the material is allowed to fall from the table of the machine directly



The Car Straightener Is Located in the Body Shop

At left, the beams are dropped into pockets in the floor. Right, ll twelve of the beams are raised in this picture. In practice nly such beams are raised as necessary for straightening. Above, a car in the press being straightened. Note the extension beam bolted to the regular beam to permit straightening the upper part of the car.

This Picture of the Basement Beneath the Woodworking Shop Was Taken Entirely with the Light from the Regular Illuminating System

onto the truck, which can then be moved to the next step in the progress of the work without further handling.

A small separate building has been constructed to the north of the main building to form a dry kiln. This is so arranged that a car loaded with lumber may be run directly into it. It is supplied with steam from the main heating plant.

It is estimated that owing to the layout there will be a saving of at least 35 to 40 per cent in the cost of repair work in this department over what was possible in the old shop, together with a much improved quality of work performed.

PAINT SHOP EQUIPMENT

The paint shop is located in the northeast portion of the building. It is entirely inclosed, so as to keep it free from dust and dirt, and so that the fumes will not penetrate other parts of the building. It has 13 tracks, each of two-car capacity, two tracks of three-car capacity, and a wash bay with space for four cars, making a total of 36 cars. In addition there is a finishing room 60 ft. x 144 ft.

The paint storage is in a separate one-story building immediately north of the paint shop, and connected with it by a covered passageway, which, however, can be closed by a fire door. All paints and supplies are kept in this storeroom, minimizing the fire hazard in the main building.

A complete equipment of adjustable scaffold posts is provided for the convenience of the men while engaged in painting the cars. These consist of 4-in. hollow iron posts set in the concrete floor at regular distances. On each post are two extension arms which slide up and down on the outside, being adjustable for height and counterbalanced by weights inside the post. Planks can then be laid on these extension arms. This equipment is much safer and more convenient than scaffolding ladders.

The finishing room is efficiently located in relation to both the paint shop and the woodworking shop. Sash racks are provided for drying varnished sash, revolving tables for varnishing sash, special benches and easels, and transveyors and racks for transporting sash and car trimmings from the car to the body shop, then to the finishing room and back to the car in the paint shop to be finished.

Toilet, washroom and locker facilities for the men have been provided in balconies located at various places convenient to the various departments.

Immediately east of the armature room is the employees' lunch room, where tables and chairs are provided for the men to serve themselves with lunch. The management has made arrangements for supplying tea, coffee and milk at rates just sufficient to cover the cost.

Looking West in the Woodworking Shop. The Lumber Storage Racks Are in the Background

Association News & Discussions

"Move Over, Brother"*

The Community Safety Movement as It Is Being Worked Out in New England Communities with the Co-operation of the Electric Railways

By Lewis E. MacBrayne
General Manager Massachusetts Safety Council

IN A MASSACHUSETTS city of 125,000 population automobile traffic on one of the main streets on a Saturday night, when the suburban motorists come in to shop, has become so congested that it is necessary to post a traffic officer on duty every hundred feet to keep autos off the street railway tracks. Five lines of trolley cars enter the downtown area through this street, and without traffic control there would be a hopeless blockage. A traffic sergeant moves down the line from time to time, waving his hand, and bidding the motorists "Move over, brother."

In another city, of wider streets and an even greater volume of traffic, I saw a crowd gathered recently about a heavy trolley car and a wrecked automobile. A loquacious colored brother, who had been passing when the collision occurred, told me what had happened. "Dis gemman was drivin' to kingdom come out of de side street, an' he bust into dat car right in its middle," he said. "He was de mos' surprised gemman to see dat 'lectric car dar."

It seems to me that one phase of our present highway problem, as it concerns autos and street cars, is described in those two phrases: "Move over, brother," and "Driving to kingdom come." One group of motorists, with no real intention of adding to the troubles of a fully occupied motorman, is continually cutting in on the trolley, but without causing much personal injury. The other is as frequently shooting out of intersecting streets into highways where there are no traffic men on duty, heading straight for kingdom come, and often narrowly missing arriving there. An analysis of 7,675 auto accidents that have occurred recently in Connecticut cities shows that 650 were collisions with trolley cars; not an unduly large proportion, but important in view of the fact that the street car was the only object in the various types of collisions that was moving over a defined and restricted route.

I need not discuss with you today the particular type of a collision with which you are all familiar. May I, instead, consider the broader problem of how much more acute our highway problem in New England may become, and to what degree we can lessen it as it develops.

I have been serving as a member of the special committee recently appointed by the Governor of Massachusetts to investigate the causes that have resulted in an abnormal increase in highway fatalities within the state since last summer. Considerable evidence presented to us served to lead to the conclusion that we had reached the point of saturation when 500,000 motor vehicles were registered within the state; or, to put it in simple terms, our small state, with its 39 cities and numerous towns, would safely hold only half a million motor vehicles, and that beyond that number we were creating so many potential hazards that we must be prepared to pay a higher price, in life and limb. The end of April, however, appeared to upset this theory, for the increase in fatalities that had been going on for four months was checked with a reduction of five deaths over the previous April, and for no apparent reason than the widespread publicity given to the daily sessions of the committee, and several organized safety drives on in various cities of the state. Up to the present time in May the month records a reduction of ten deaths as compared with the same period a year ago, and it is apparent that the human factor is still the important element in the problem.

Now just what are we to conclude from this? A medical examiner of one of our counties, writing to me yesterday, said that he believed that our spasmodic safety campaigns were all wrong, since the public returned to its careless ways soon after these intensive periods were over. He urged that we develop some method of carrying on a permanent campaign of education. I partly agree with him, because I have been seeking data, for the past two years, to determine just how long the respect of the law, or the good intentions of the individual—you may take it either way—survives the community campaign. In Lawrence, where the Massachusetts Safety Council supervised a safety campaign last October, our real dividends were checked up in the 30 days that followed. There were only six serious accidents as against 16 for the same period in the previous year. There were no fatalities as against six for the corresponding period. A 30-day safety campaign put on in an industrial plant in Buffalo last October obtained only moderate results at the time, but there has been a steady improvement ever since, and in six months a reduction of 66 per cent in the number of accidents was recorded.

My own organization is now receiving calls for service of a type that perhaps indicates the trend of this community safety work. The city of Somerville had the unfortunate experience last year of killing ten children to four adults on the highway. The proportion should have been seven adults to six children. When we gave publicity to this fact the city, at first through its Rotary Club, and later through its Mayor and other city officials, requested us to look into local conditions and suggest a remedy. We found one or two abnormal conditions, such as a police force with no adequately trained traffic squad, due to local financial reasons, but speaking generally it was a situation existing in several other cities; an increasing stream of intercity traffic, many street cars contributing to the obstructed view, mothers of young children not yet conscious of the abnormal highway conditions.

Somerville has now organized, not for a special safety drive, but for a campaign to extend throughout the season. Every civic organization is represented upon the general committee. Local speakers are being trained for safety talks. Meetings with safety films have been held in all the schools. A series of articles, discussing all phases of the accident problem, is being prepared for the press. The whole city will eventually concern itself with its own safety.

You may reasonably ask me, at this point, what has all this to do with the subject of my paper, "Move Over, Brother." Well, just how are you going to move Henry Ford's mobile army —not to mention the several other makes—from your car tracks? The motorman cannot verbally swat each one, nor can the superintendent of the division personally police the entire system. It must be done by creating enough public opinion to cover the entire highway problem. It must therefore be included in the community safety program.

We are supervising such a program in Chelsea during the present week. The city is about to observe its 300th anniversary, but its highway and fire hazards are such, and its population is composed of so many racial groups, that the Mayor, an energetic young man, was unwilling to open the celebration before his city had put itself in the frame of mind to think and act safety. The following program was accordingly worked out for him. Last Friday a printed message, illustrated with four street hazards, among them the street car, was sent into 10,000 homes. On Saturday, at seven theater performances, 7,200 children saw safety reels and were told how to cross a street safely, with an emphasis upon the danger of running in front of the street car, because of the fast moving auto

*Paper presented before New England Street Railway Club, Boston, May 22, 1924.

that it might conceal. On Sunday the clergymen all talked safety, and on Monday we began a series of four-minute talks in the theaters, one being devoted to the motorists' place on the highway. Other features included daily safety articles in the press and the use of 800 posters with the slogan, "Motorists, Slow Down."

When such a program is on it is sometimes possible to include a street railway man as a four-minute speaker. At Lawrence we found a motorman who developed a telling talk in the course of the week. I may remark here that we furnish an outline for every talk scheduled, no matter what its topic, in order that the psychology of its presentation may be correct, and certain important facts be stressed. Nature has gifted very few of us who are engaged in daily tasks with the power of ready expression, and yet the man in uniform—traffic officer, fire chief or motorman—has a quick appeal to an audience when we have taught him how to present his story.

I have been watching with interest the effort of one of our street railway systems in Massachusetts to sell its service to the public over its own dashboard. We were advised during midwinter that it was cheaper to put up the auto and use the street car. We were informed that the trolley was convenient for shopping. All this is legitimate, and suggests to me that it might be possible, if collisions with motor vehicles still increase, to get over our "Move over, brother," plea in a like manner. What would be the effect on the average operator of an auto to read, as he approached a street car, "Motorists, please give this car the right of way on its own rails," or "Auto drivers can help this street car reduce collisions." In the first place, it would establish in the public mind the fact that the street railway company was concerned over the highway problem, and anxious to gain co-operation in solving it. Public opinion often develops along such a lead as this. In the second place, it would put the careless motorist in the position of being reckless in the face of a protest.

The theory has been advanced that our more conservative citizens, the people of good judgment, were all included in the first ten million automobiles purchased in the United States, and that the last five million have given us a larger proportion of inexperienced and careless operators. My own idea is that we still have only about 4 per cent of drivers who ought to be ruled off the highways, but that the increasing total of motorists in the country automatically increases this group so that it becomes more evident and more noticeable. The point of automobile saturation for the United States has been set as high as 20,000,000, and for Massachusetts as high as 1,000,000. Nobody knows that it really is, and the industrial and agricultural prosperity of our people is undoubtedly a factor.

We have been killing 1,000 more persons annually for each million new motor vehicles put into commission. We have been increasing the number of collisions involving automobiles. But if the human factor is still the controlling one, then our task is to educate the individual in the control of speed and the elimination of fool chances. Too many drivers, many of them young and untaught in the value of human life, are driving for kingdom come. One can almost imagine them, hurled into eternity, picking up a new and joyous equipment of wings, and speeding on through the realms of space, cutting in and out on other angels, and eventually duplicating all the collisions that they had on earth.

Electric Locomotives Discussed at A.S.M.E. Meeting

Tendencies in Recent Designs Are Given by N. W. Storer and A. H. Armstrong—Reasons for the Adoption of Various Types of Drive and Arrangement of Mechanical Parts Are Emphasized

TWO papers on the subject of developments in electric locomotives were presented at the spring meeting of the American Society of Mechanical Engineers held at Cleveland, Ohio, May 29. One was by N. W. Storer, general engineer Westinghouse Electric & Manufacturing Company, the other by A. H. Armstrong, railway engineer General Electric Company.

Brief descriptions of some of the recent Westinghouse electric locomotives were given by Mr. Storer. These included the locomotives for the Paulista Railway of Brazil, the Chilean State Railways, the New York, New Haven & Hartford, the Norfolk & Western, the Virginian and the Pennsylvania. These locomotives have been described in various issues of the ELECTRIC RAILWAY JOURNAL. The principal features of the design were tabulated by Mr. Storer. They are given in the table on page 900.

Another type of locomotive which has been discussed more or less in the last few months is the motor-generator type, which it was announced some time ago was being built by the Ford Motor Company for the electrification of the Detroit & Ironton Railway. This locomotive, Mr. Storer said, will operate under a 22,000-volt, single-phase, 25-cycle trolley, but will have an oil-cooled transformer to reduce the voltage to a low value for a synchro-

DATA ON GENERAL ELECTRIC COMPANY ELECTRIC LOCO

	Gearless Passenger								Geared Passenge	
General Data	N. Y. C. Type "S" (122 ton)		N. Y. C. Type "T" (133 ton)		C. M. & St. P. Pass. (260 ton)		Paris-Orleans Pass.		Paulista Pass. (120 ton)	B.
Diameter of drivers	44 in.		36 in.		44 in.		47.2 in.		42 in.	
Number of driving axles	4		8		12		6		4	
Diameter of guiding wheels	36½ in.		.....		36 in.		36 in.		36 in.	
Number of guiding axles	4		.....		2		4		4	
Total wheel base	36 ft. 0 in.		46 ft. 5 in.		67 ft. 0 in.		53 ft. 6 in.		46 ft. 0 in.	26
Width over all										
Length inside knuckles	43 ft. ½ in.		56 ft. 10 in.		76 ft. 0 in.		62 ft. 5 in. (over buffers)		55 ft. 0 in. (over buffers)	37
Height over trolley, locked down	15 ft. 1 in.		15 ft. 1 in.		16 ft. 8 in.		12 ft. 7 in.		14 ft. 3 in.	13
Ratings	1 Hr.	Cont.	1 Hr.	Cont.	1 Hr.	Cont.	1 Hr.	Cont.	1 Hr.	Cont. 1 Hr
Amperes	2,300	1,060	3,000	2,480	990	860	1,200	1,275	460	440 39
Tractive effort, lb.	15,200	4,900	15,100	11,500	48,500	40,800	12,750 11,620	13,650 F.F.* 12,600 S. F.*	14,750	13,900 16,80
Coefficient of adhesion—per cent	10.5	3.3	5.7	4.34	10.59	8.9	7.54 6.9	8.1 F. F.* 7.5 S.F.*	9.2	8.7 10
Speed at full rated voltage	41.8	60.6	54.0	59.0	27.1	28.7	58.0 64.0	56.5 F.F.* 62.8 S.F.*	42.8	43.4 25
Horsepower-driver	1,691	792	2,180	1,810	3,500	3,300	1,940 1,985	2,060 F.F.* 2,100 S.F.*	1,680	1,608 1.14
Horsepower-output										
Maximum safe speed, m.p.h.	80		85		90		.....		56	
Tractive effort—25 per cent adhesion	37,125		66,250		114,450		42,300		40,000	
Weights										
Total	244,500		265,000		521,200		240,000		240,000	
On drivers	148,500		265,000		457,800		169,000		160,000	
Per driving axle	37,125		33,125		38,150		28,170		40,000	
Mechanical	184,500		177,000		286,550		137,000		160,300	
Electrical equipment	60,000		88,000		234,650		103,000		79,700	
Track gage	4 ft. 8½ in.		4 ft. 8½ in.		4 ft. 8½ in.		4 ft. 9 in.		5 ft. 3 in.	4
Motors										
Number	4		8		12		6		4	
Type	GE-84-A		GE-91-A		GE-100		GE-101-A		GE-267-A	G
Rated voltage	600		600		1,000/3,000		750/1,500		1,500/3,000	1,2
Method of drive	Direct		Direct		Direct		Direct		Twin Gear, Springs	Twin
Gear ratio	Gearless		Gearless		Gearless		Gearless		70/30 = 2.33	80/
Ventilation	Natural		Forced		Forced		Forced		Fan on Arm.	
Regenerative control	No		No		Yes		No		Yes	

*F.F.-Full field; S.F.-Short field.

ious motor-generator furnishing direct current for motors mounted on the axles. The reason for reviving the motor-generator idea, which was proposed a good many years ago, is that recent developments have made it possible to design a motor-generator set of sufficient capacity for heavy locomotives without excessive weight or dimensions. The control of this type of locomotive is ideal, as all of the motors may be connected permanently in parallel and supplied with current from the generator at any desired voltage. The control of the motor fields will permit the locomotive to develop its full horsepower rating over a wide range in speed and thus to secure one of the excellent characteristics of the steam locomotive.

While it may at first appear that a motor-generator type of locomotive is simply a direct-current locomotive with transformer and motor-generator set added, such is not the case, as the motors will be smaller and more rugged than high-voltage direct-current motors, since they will be wound for low voltage and operated on an ungrounded circuit which is individual to the locomotive. This reduces the amount of control apparatus very greatly and thus not only decreases the weight but also the cost of the equipment. While none of these locomotives has been completed, the speaker holds that this type will have an important place on alternating-current railways.

In all the locomotives described there are three types of driving motors and three distinct types of drive, Mr. Storer pointed out. In general, it may be stated that the choice of drive and the wheel arrangement, which together practically determine the entire design, will depend, first, on the class of service, i.e., whether it is freight or passenger, slow, medium or fast, light or heavy, the permissible wheel loading, track alignment, etc.; second, on the kind of driving motor that is to be used, i.e., whether direct-current, single-phase commutator type, or three-phase induction motor, and, third, on the judgment of the engineers who direct the design.

It is taken for granted that every one is striving to secure a locomotive that will in the last analysis show the greatest economy in operation, i.e., one which will give the lowest total cost per ton-mile. The assumption that a locomotive with maximum power concentrated in a single unit on the minimum number of driving wheels will produce this result, while true in the case of the steam locomotive, may be questioned and requires a specific analysis in each case for the electric. One of the principal reasons for the use of the maximum size of locomotive with a steam engine, the cost of engine crews, has no application at all on the electric. By the use of multiple-unit control it is everyday practice for one crew to handle as many motive-power units as can be desired at one point in the train. Where a very heavy locomotive is required, the capacity of motive-power units should therefore be selected from the points of view of convenience, first cost and operating cost, with due consideration to the effect on track and bridges.

After pointing out some of the points to be settled in the design, the author stated that he appreciates that there are not yet sufficient data available to make anything more than a few general statements in regard to these points, but he feels that the subject is one of such importance that it should be very carefully studied. The very active interest that is now aroused in railway electrification will naturally result in further engineering analyses of this subject.

The tendency in heavy locomotive design for freight use seems to be toward the use of maximum axle loadings and transmission by gears, jackshaft and side rod from motor to axles, together with the combination of the cab with the side frames. There is also a noticeable tendency toward the use of the individual drive with spring-mounted motors for higher speed locomotives of large capacity. For locomotives with small capacity and axle loading with direct-current motors, the axle-hung motor certainly has the field.

VY SERVICE

	Geared Freight								Geared Side Rod
St. P.	Mexican Freight (150 ton)		Paulista Freight (100 ton)		Spanish Northern Freight		B. A. & P. Freight (81 ton)		N. Y., N. H. & H. (Bull Moose) (125 ton)
	46 in.		42 in.		39.37 in.		46 in.		54 in.
	6		4		6		4		4
	.....		.....		.....		.....		36 in.
	.....		.....		.....		.....		4
B in.	40 ft. 6 in.		26 ft. 8 in.		35 ft. 0 in.		26 ft. 0 in.		54 ft. 10 in.
									10 ft.
0 in.	52 ft. 11 in.		39 ft. 2 in. (over buffers)		46 ft. 0 in. (over buffers)		37 ft. 4 in.		62 ft. 0 in.
in.	15 ft. 2 in.		14 ft. 3 in.		13 ft. 5 in.		15 ft. 6 in.		14 ft. 5 in.
Cont.	1 Hr.	Cont.	1 Hr.	Cont.	1 Hr.	Cont.	1 Hr.	Cont.	1 Hr.	Cont.
920	750	690 F.F.* 690 S.F.*	460	440	440	430	392	370	1,800	1,600
79,500	51,600	46,200 F.F.* 33,720 S.F.*	28,900	27,300	27,100	26,500	25,600	23,600	27,000	22,200
17.65	16.7	14.95 10.9	14.45	13.65	15.75	14.8	15.8	14.6	13.9	11.5
15.4	19.9	20.45 28.0	21.8	22.1	21.6	21.9	16.6	17.0	23.0	26.4
3,280	2,740	2,520 2,520	1,680	1,610	1,550	1,550	1,135	1,070	1,650	1,560
35	.....		31.1		34		30		45	
00	77,250		50,000		44,800		40,500		48,500	
00	309,000		208,000		179,000		162,000		291,000	
00	309,600		200,000		179,000		162,000		194,000	
50	51,500		50,000		29,830		40,500		48,500	
00	174,000		120,300		95,000		102,000		172,000	
00	135,000		79,700		84,000		60,000		119,000	
in.	4 ft. 8½ in.		5 ft. 3 in.		5 ft. 6 in.		4 ft. 8½ in.		4 ft. 8½ in	
	6		4		6		4		4	
3-A	GE-278-A		GE-267-A		GE-255-B		GE-229-A		GEA-614	
,000	1,500/3,000		1,500/3,000		1,000/3,000		1,200/2,400			
Springs	Twin Gear, Springs		Twin Gear, Springs		Single Gear, Solid		Twin Gear, Solid		Geared, Side Rod	
4.55	90/18 = 5.0		82/18 = 4.55		72/18 = 4		87/18 = 4.83		71/35 = 2.03	
ed	Forced		Fan on Arm.		Forced		Forced		Forced	
s	Yes		Yes		Yes		No		No	

Flexibility of Electric Drive Permits Radical Departures

In discussing the trend of electric locomotive design, Mr. Armstrong stated that the electric motor, with its great flexibility, permits a radical departure from steam engine practice in both the design and operating characteristics of the locomotive. In fact, the electrical engineer is embarrassed in his attempt to arrive at a standard type of electric locomotive for any class of service because of the variety of designs available, any one of which may be successful in operation. The speaker gave illustrations from the experience of his company, describing a considerable number of designs. The principal design features were summarized in a table, which is presented below.

With regard to electric locomotive rating, the speaker stated that a study of many train dispatchers' sheets, showing trailing and engine tonnage actually hauled by locomotives of different types, indicate that the total gross tractive effort exerted at the driver rims agrees approximately to 18 per cent of the total driver weight. Starting effort may reach as high as 25 per cent or even 30 per cent under favorable conditions. Mr. Armstrong presented a table showing that the continuous tractive effort of a number of modern electric freight locomotives averages 14.06 per cent of the driver weight, that of electric passenger locomotives averages 7.35 per cent and of electric switching locomotives 9.53 per cent.

With regard to wheel arrangement, the speaker concluded that this is apparently not a matter of much concern in its effect on riding qualities of the electric locomotive for speeds below 50 m.p.h., i.e., the field of the freight locomotive. For the higher speeds incident to passenger train operation a four-truck construction has found favor on account of its minimum effect upon track and flange wear.

There are, apparently, two broad lines being followed in the development of the electric locomotive: First, direct application of the motor to the driving axle, and, second, the interposition of jack shaft and side rods. Geared axle drive for lower speeds and both geared axle and gearless drive for higher speeds have been so successful in meeting every railroad requirement that they may be regarded as accepted standards with direct-current motor equipment, Mr. Armstrong said. The bipolar gearless motor drive is restricted to direct-current motors, but geared axle drive is available to both direct-current and alternating-current motors, provided the axle weight in the latter case does not much exceed 40,000 lb.

Geared quill and side rod drive are favored for single-phase motor application to heavy duty locomotives, as providing the additional space required for the best design of such motors. The

latter construction, especially, apparently finds its best expression in very high driving axle weights and long rigid driving wheel base, thus possibly restricting the application of such locomotives to roadbeds most favorable for their operation. These same forms of construction are also open to direct-current motor applications, but apparently find little favor as compared to the simpler and more efficient direct axle drive which is employed in nearly every locomotive equipped with direct-current motors.

Midwest Association Program

THE following program has been announced for the annual meeting of the Midwest Electric Railway Association to be held in the Fontenelle Hotel, Omaha, Neb., on June 11 and 12:

JUNE 11

Morning Session

The Future of City Transportation.

"Traffic and Congestion," by R. J. Lockwood, St. Louis, Mo.

"The Economics of City Transportation," by E. R. Stenger, Denver, Col.

Open discussion on "The Bus and Its Place."

Afternoon Session

"Indirect Taxes and the Car Ride," by S. B. Irelan, St. Joseph, Mo.

"Service and the Man Who Sells It," by F. G. Buffe, Kansas City, Mo.

JUNE 12

Morning Session

"The Interurban Railway—Its Past, Present and Future," by Bruce Cameron, Pittsburg, Kan.

DATA FOR NEW WESTINGHOUSE ELECTRIC LOCOMOTIVES

Railroad	Number in Service	Class of Service	Contact Voltage	Conductor Type	Type of Loco.	Class, by Wheels	Driving Wheels No.	Driving Wheels Diam.	Truck Wheels No.	Truck Wheels Diam
Paulista Railway	1	Passenger	3,000	Catenary	d.c.	2–4 + 4–2	8	63 in.	4	36 in.
	2	Freight	3,000	Catenary	d.c.	0–6 + 6–0	12	40 in.	..	...
Chilean State Railways	1	Express passenger	3,000	Catenary	d.c.	2–6 + 6–2	12	42 in.	4	30 in
	2	Local passenger	3,000	Catenary	d.c.	0–4 + 4–0	8	42 in.	0	...
	3	Freight	3,000	Catenary	d.c.	0–6 + 6–0	12	42 in.	0	...
	4	Switcher	3,000	Catenary	d.c.	0–4 + 4–0	8	42 in.	0	...
N. Y., N. H. & H. R. R.	12	Passenger	600 11,000	d.c. 3d rail a.c. Catenary	d.c. & a.c.	2–6–2 + 2–6–2	12	63 in.	8	36 in.
Norfolk & Western	8	Motive Power	11,000	Catenary	a.c.	2–8–2	8	62 in.	4	33 in.
The Virginian	36	Freight Units	22,000 11,000	Catenary	a.c.	2–8–2	8	62 in.	4	33 in.
Pennsylvania	1	2 Passenger	650	3d rail	d.c.	2–8–2	8	80 in.	4	33 in.
	2	1 Freight	11,000	Catenary	a.c.	2–8–2	8	80 in.	4	33 in.

Railroad	Articulated Trucks	Wheelbase Rigid	Wheelbase Total	Weight in Pounds Total Road Weight	On Drivers	Per Driving Axle	Mech. Parts	Equipment[1]
Paulista Railway	1 Yes	8 ft. 4 in.	41 ft. 2 in.	283,800	205,800	51,450	165,400	118,400
	2 Yes	14 ft. 0 in.	37 ft. 0 in.	234,300	234,300	39,050	144,050	90,250
Chilean State Railways	1 Yes	14 ft. 5 in.	48 ft. 4 in.	259,800	210,000	35,000	153,966	105,834
	2 Yes	8 ft. 4 in.	26 ft. 0 in.	160,000	160,000	40,000	93,000	67,000
	3 Yes	13 ft. 9 in.	37 ft. 0 in.	230,000	230,000	38,333	138,400	91,600
	4 No	8 ft. 6 in.	27 ft. 4 in.	137,000	137,000	34,250	80,900	56,100
N. Y., N. H. & H. R. R.	Yes	14 ft. 3 in.	59 ft. 6 in.	358,000	240,000	40,000	175,200	182,800
Norfolk & Western	No	16 ft. 6 in.	37 ft. 6 in.	414,000	300,000	75,000	251,500	162,500
The Virginian	No	16 ft. 6 in.	37 ft. 6 in.	414,000	300,000	75,000	.....	.....
Pennsylvania	1 No	22 ft. 3 in.	54 ft. 11 in.	approx. 400,000	300,000	75,000	225,100	174,900
	2 No	22 ft. 3 in.	54 ft. 11 in.	408,000	300,000	75,000	225,100	182,900

[1] Includes sand, air brakes, etc.

Railroad	Dimensions Length Over All	Dimensions Width Over All	Dimensions Height Trolley Down	Regen. Control	Motors No.	Motors Method of Drive	Gear Ratio
Paulista Railway	1 52 ft. 11 in.	10 ft. 7 in.	14 ft. 10 in.	Yes	4 Twin	Geared quill	28 : 86
	2 50 ft. 2 in.	10 ft. 6.5 in.	14 ft. 10 in.	Yes	6	Geared	16 : 63
Chilean State Railways	1 58 ft. 5 in.	10 ft. 6.75 in.	14 ft. 4 7/16 in.	Yes	6	Flexible gear	21 : 56
	2 38 ft. 9.5 in.	10 ft. 7 in.	14 ft. 2 7/16 in.	No	4	Flexible gear	21 : 56
	3 49 ft. 9.5 in.	10 ft. 6.75 in.	14 ft. 4 7/16 in.	Yes	6	Flexible gear	15 : 63
	4 40 ft. 0 in.	10 ft. 6.75 in.	14 ft. 2 7/16 in.	No	4	Gear	16 : 63
N. Y., N. H. & H. R. R.	68 ft. 6 in.	10 ft. 2.5 in.	Over d.c. Trolley Down 14 ft. 9½ in.	No	6 Twin	Geared quill	25 : 89
Norfolk & Western	48 ft. 7 in.	10 ft. 5 in.	16 ft. 0 in.	Yes	2	Flexible geared jack shaft and side rod	21 : 100
The Virginian	.....	10 ft. 5 in.	16 ft. 0 in.	Yes	2	Flexible geared jack shaft and side rod	.....
Pennsylvania	1 68 ft. 2.5 in.	10 ft. 3 in.	15 ft. 6 in.	No	4	Flexible gear and side rod	50 : 98
	2 68 ft. 2.5 in.	10 ft. 3 in.	15 ft. 6 in.	No	4	Flexible gear and side rod	30 : 118

Railroad	Tractive Effort in Pounds One-Hour Rating F. V.	Per Cent Coefficient of Adhesion	Continuous Rating F. V.	Per Cent Coefficient of Adhesion	Starting
Paulista Railway	1 20,960	10.0	14,240	6.9	54,400 maximum
	2 32,400	13.8	21,600	9.2	77,310 33 per cent adhesion
Chilean State Railways	1 25,800	12.3	19,800	9.4	70,800 maximum
	2 17,200	10.8	13,200	8.3	47,200 maximum
	3 31,200	13.6	24,360	10.6	75,900 33 per cent adhesion
	4 [2] 23,000	16.8	11,000 [2]	8.0	45,210 33 per cent adhesion
N. Y., N. H. & H. R. R.	23,160	9.66	16,200	6.66	52,500 maximum
Norfolk & Western	8 Poles 108,000	18.0	90,000	15.0	185,000 maximum
(2 M.P.U.)	4 Poles 63,000	10.5	52,500	8.75	110,000 maximum
The Virginian	.....	.....	.....	.....	.....
Pennsylvania	1 44,000	15.47	36,000	12.64	86,000 maximum
	2 59,000	19.72	50,000	16.66	100,000 33 per cent adhesion

[2] Self-ventilated. F.V. = force ventilated.

Railroad	Speed, Miles per Hour One-Hour Rating	Continuous Rating	Maximum Safe	Horsepower of Locomotive One-Hour Rating F.V.[3]	Continuous Rating F.V.[3]	Builder of Mechanical Parts
Paulista Railway	1 42.8	47.2	65	2400	1800	Baldwin
	2 20.8	23.4	42	1800	1350	
Chilean State Railways	1 36.0	39.75	63	2460	2040	
	2 36.0	39.75	56	1640	1360	Baldwin
	3 21.5	23.0	44	1800	1500	
	4 10.5	12.75	35	640	384	
N. Y., N. H. & H. R. R.	32.6	38.4	77	2016	1656	Baldwin
Norfolk & Western	8 P 14.10	14.20	38	4060	3400	
(2 M.P.U.)	4 P 28.30	28.40	..	4750	4000	American
The Virginian	.....	.....	..	4060	3400	
	.....	.....	..	4750	4000	American
Pennsylvania	1 35.9	37.8	70	4100	3630	
	2 21.00	23.0	35	3300	3070	Penna. R. R

[3] F.V. = force ventilated.

"Bringing the Latest and Best to the Railway Men," by R. F. Carbutt, New York.

On the evening of June 11 those attending will be guests of the Omaha & Council Bluffs Street Railway at a dinner and entertainment. A banquet will be held at the Fontenelle Hotel on the night of June 12. The speaker is to be H. G. Taylor, who is a member of the Nebraska State Railway Commission and also president National Association of Railway and Utility Commissioners.

American Association News

Get Ready for the Railway Exhibit

By Fred C. J. Dell
Director of Exhibits American Electric Railway Association, New York

APPLICATIONS for exhibit space and diagram of the space layout on Young's Million Dollar Pier for the forty-third annual convention of the association went out from association headquarters on June 2 by registered mail. The date limit set for the return of space requests is June 30. All applications received up to and including June 30 will be given preference as far as possible in priority of receipt. All applications that arrive after June 30 will be allotted space by the director of exhibits in the order in which they are received.

Now is the time for manufacturers to begin to plan their displays in detail. There were instances at the last convention where companies were assigned certain spaces and a month prior to the opening of the convention these same companies wanted additional space adjacent to that already assigned. Needless to say they were disappointed. Other companies were late in getting applications in, with the result that they had no choice whatever in the matter of space location.

Each year the convention has grown in size, and it is interesting to note the following figures from the attendance standpoint as well as from the number of square feet of exhibition space occupied by manufacturers for actual display purposes:

Year	Convention Location	Total Registration	Square Feet of Space Sold
1916	Atlantic City	3,271	57,392
1917	New York	Conference only	No exhibit
1918	New York	Conference only	No exhibit
1919	Atlantic City	3,166	62,219
1920	Atlantic City	3,300	59,529
1921	Atlantic City	1,189	No exhibit
1922	Chicago	4,200	61,895
1923	Atlantic City	4,404	75,681

In a survey made by various members of the committee on convention location earlier in the year the preference expressed was decidedly for Atlantic City this year and with exhibits. In the first issue of the ELECTRIC RAILWAY JOURNAL this year "a great year for the electric railways" was predicted, and from actual observation during the first quarter the prophecy seems to be running about true to form. Manufacturers will again have the opportunity to show what they have been accomplishing in the way of new things for the benefit of the industry.

The maintenance show in Chicago last March had on display over 100 new devices and products—a great record for manufacturers who in the period of one year could demonstrate 100 new things which had been perfected and patented for the safety, economy and better operation of the steam roads. We wonder what will be the answer of the manufacturers of material for electric properties. Will they equal this record?

The question will be answered next October, and in the meantime, we say begin right now, Mr. Manufacturer, to plan your display; get your space applications in to association headquarters on or before June 30. The exhibit committee will meet early in July to make the initial space assignment, and for the good of the industry and for the advancement of the art it is your duty to show what you have to the 4,000 or more delegates who will go to Atlantic City next October prepared to see, study and take home with them new thoughts and ideas that will make for better transportation.

From May 19 to 22, inclusive, the first exhibit of the National Automotive Service convention was held in Detroit, at which there was an exhibit of 103 automotive maintenance equipment manufacturers. This convention was held under the auspices of the National Automobile Chamber of Commerce in co-operation with the Society of Automotive Engineers, Motor and Accessory Manufacturers' Association, National Automobile Dealers' Association, Automotive Equipment Association and the Service Equipment Association.

It was the first exhibition on a comparatively large scale ever held and the manufacturers' exhibits included portable tools, machine tools, instruments for inspection and stockroom equipment. The 103 concerns exhibiting comprised the most representative companies engaged in creating automotive service equipment. Every tool, whether power driven or manually operated, was shown in actual use and visitors were afforded an exceptional opportunity to study advanced facilities for increasing the efficiency of service work.

There are now 141 railway companies operating motor buses as auxiliaries or feeders to existing lines. The question of maintenance is one of decided interest to the superintendents of equipment, master mechanics and shop foremen. The association will extend to the manufacturers of automotive maintenance equipment an invitation to join the association and have an exhibit of their products at the October convention, and it is felt many will avail themselves of the opportunity to participate.

This should prove of decided interest to the executives of these 141 companies operating buses and it is confidently hoped that they will recognize the value of such an exhibit and authorize their subordinates to attend the convention this year.

Joint Committee on Engineering-Accounting

A MEETING of the joint committee on engineering-accounting was held at the headquarters of the association on May 27. The following committee members were in attendance: P. R. Jacques, Leon R. Brown, chairman of the engineering committee, and George F. Dinneen, chairman of the accounting committee.

The advisability of modifying the classification submitted by the committee to the association at the 1923 convention was discussed, and it was decided to prepare three classifications for roads, depending upon the amount of annual gross receipts, using the classification submitted with last year's report as a basis to work upon. The chairmen will prepare the classifications and are to submit them to the members of the committee for consideration.

Convention Plans Shaping Up

RAPID progress is being made by the convention committee of the American Electric Railway Association. Subjects to be discussed have been agreed upon, speakers are being obtained, and transportation and exhibit arrangements perfected.

Outstanding subjects to be discussed are: Financing of electric railways, including a discussion of customer ownership; co-ordination of motor vehicle and electric railway service; necessity of electric railway service to communities, to be discussed by the mayor of a large city, a real estate man of national prominence, a United States Chamber of Commerce representative, a public utility commissioner, and a national manufacturer; management and modernization, and traffic problems.

The "Management and Modernization" discussion will be led by regional vice-chairmen of the city and interurban operating committees. These fourteen men, during the last year, have been conducting a survey of electric railway properties throughout the United States in an effort to unearth the most progressive practices.

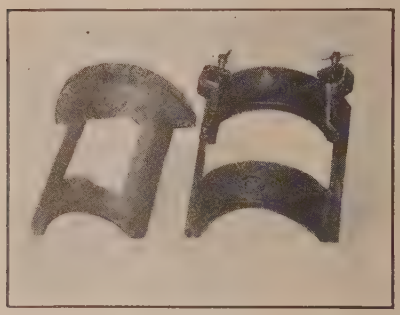
An innovation of setting aside one day wholly for the inspection of exhibits has been suggested by the committee on meetings and subjects. If this suggestion is carried out, no meetings of any associations would be held on Wednesday and a Friday morning session of the American Association would be held.

Encouraged by the success of the inspection and exhibits by a special committee headed by the president last year, the meetings and subjects committee has suggested that the plan be carried out again.

Maintenance of Equipment

Jig for Drilling Axle Bearings

THE axle bearings used by the Eighth Avenue Railroad, New York, N. Y., require drilling for dowel pin holes. A convenient jig has been designed in the shop for accurately locating the holes and saving time in the drilling operation.



The Axle Bearing at the Left Has Just Been Drilled for Dowel Pins in the Jig at the Right

An accompanying illustration shows the jig at the right hand side of an axle bearing, which has just been drilled.

The jig has two extension arms at the end which fit over the flange of the axle bearing. These arms are provided with thumb screws, so that with the axle bearing in place in the jig, these are tightened down to hold the bearing firmly in position. This method of clamping insures that the dowel pin holes are accurately located from the flange of the bearing. The holes in the jig are bushed with case-hardened bushings.

Armature Bearing Shells Turned on Special Centers

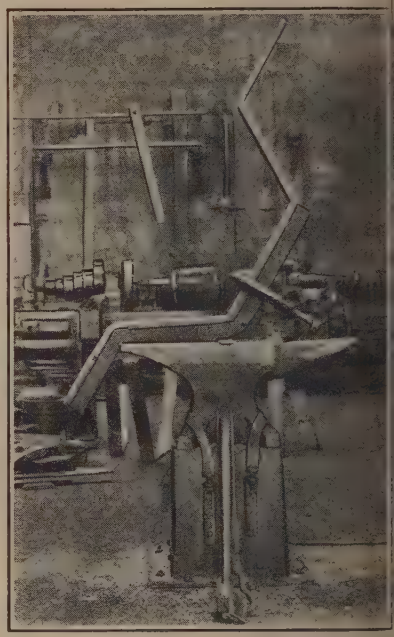
TURNING the outside of armature bearing shells in a lathe is facilitated in the shops of the Pittsburgh Railways by the use of special lathe centers. These eliminate the practice of putting the bearing on a long mandrel and driving it through a dog. The drive to the bearing in this "set-up" is through the live center. This permits the cutting tool to travel the full length of the shell without reversing the work.

Both centers are tapered to a 60-deg. angle and are larger at the base than the bore of the armature shell. The live center is three-sided, while the dead center is conical. This type of center aligns the shell with the inside bore. The three corners of the live center are forced into the rim of the shell by pressure applied by the tail stock through the dead center.

Inasmuch as the usual type of friction bearing between the dead center and the shell would cause slipping of the driving teeth of the live center, a thrust bearing has been incorporated in the design of the dead center.

Convenient Form for Bending Arch Bars

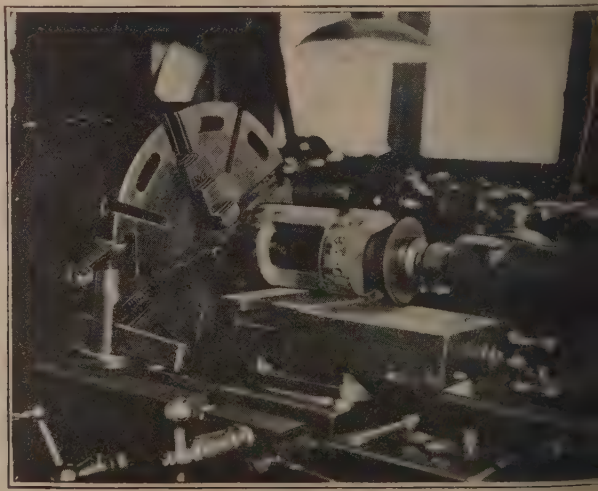
IN REPLACING the arch bars on trucks where these have become broken, the Philadelphia & Western Railway, Norristown, Pa., uses a



Completed Arch Bar in Position After Bending

convenient form for bending the new bars to shape This form is made of square steel stock of the same size as

Live and Dead Centers Are Tapered to 60 Deg., the Live Center Being Three-Cornered and the Dead Center Conical and Containing a Thrust Bearing



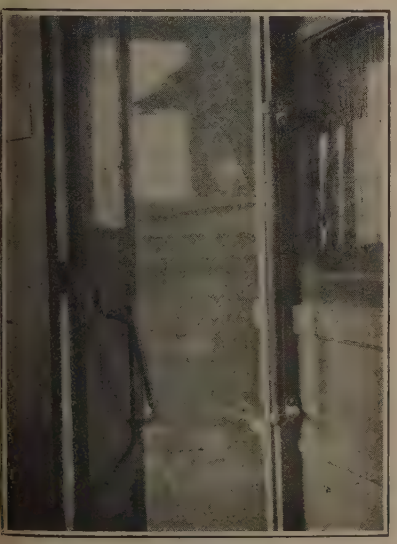
Tapered Centers Hold Armature Bearing Shell, the Live Center Driving the Shell Through Contact of Triangular Live Center

the longer dimension of the arch bar. A piece of mild steel of the required dimensions is heated in a forge at the point where the bend is to take place. This is then clamped to the form by a C-clamp, and the bar is then hammered to the required shape to fit in the form. In order to insure that the arch bar fits squarely on the form so as to have the bend at right angles to the edges a small piece extends along the edge, and the piece of steel bar fits up against this while it is held for bending. By use of this form the time for shaping the arch bar has been reduced enormously.

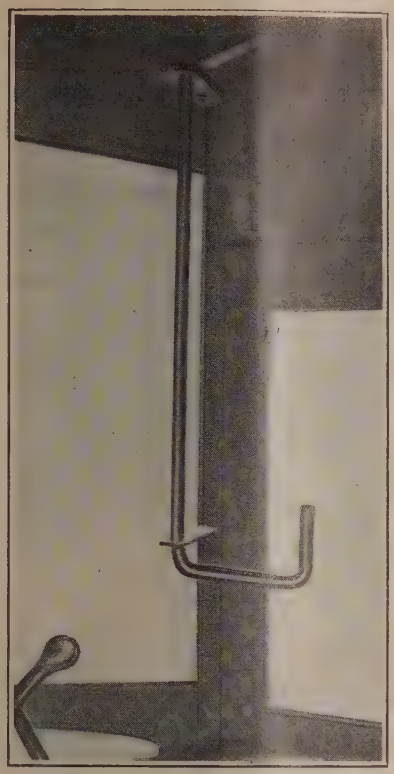
Improved Door Arrangements in Remodeled Cars

THE New York & Queens County Railway, Long Island City, N. Y., is remodeling ten of its closed cars for one-man operation. These cars originally had inclosed platforms and folding doors and the remodeling changes consist principally of changes in the platform to facilitate one-man operation.

Two sliding doors located at the bulkhead have been removed so as to facilitate passenger movement and the folding doors at the front left-hand side and rear right-hand side have been permanently screwed shut. A platform seat for two passengers has also been installed across these doors. A new stanchion has been installed just to the right of the operator's position for holding the fare box. This is a short stanchion extending about 3 ft. above the floor and it is braced to the hand brake



Arrangement of Grab Handles on Inside of Platform and on Folding Door



Operating Mechanism for Hand Control of Folding Doors

staff support. The register rod has been extended out on the platform and a pull strap added, so that fares may be rung up conveniently by the operator.

The platform doors originally were arranged to fold against the bulkhead. These have been changed with hinges added on the opposite side, so that as remodeled they fold against the dash. This arrangement provides less interference with passenger movement and also makes a more convenient installation for hand operation of the doors.

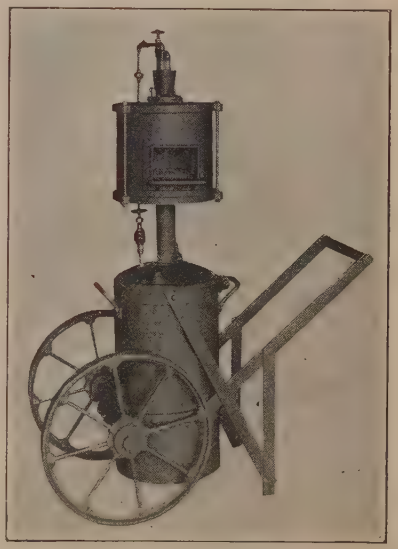
An accompanying illustration shows the mechanism added for the door operation. A 1-in. iron rod bent so as to provide a handle and lever for operation extends from a point just above the hand brake staff to the vestibule headlining. This is supported by brackets to the vestibule window post. The upper end of this rod has a bell crank lever and connection to the doors. To open the doors the operator pulls the handle toward him. In order to lock this mechanism at the rear end of the car a pin is provided with a chain fastening which fits into a recess in the top support just ahead of the bell crank lever. With the pin inserted, the door-operating mechanism cannot be moved.

These cars originally had grab handles on the outside of the doors. These have been removed and one of them installed at the bulkhead side of the door opening, inside the platform vestibule. An additional grab handle has been added to the inside of the door nearest the bulkhead. When the door is in the open position the handle is in convenient position for passengers who are boarding or alighting, and when the door is closed this handle is on the inside of the car, so that no support is provided by which passengers might hang onto the outside of the car.

New Equipment Available

Improved Oil Burning Rivet Forge

IMPORTANT changes made in the construction of the oil-burning rivet forges manufactured by the Buffalo Forge Company, Buffalo, N. Y., include an extension of the fireproof liner through the fire opening in the steel shell and a redesigned bottom plate made with a liberal shelf extension to receive hot rivets.



Portable Oil-Burning Rivet Forge

In the old rivet forge a cast-iron frame, attached to the shell with six rivets, constituted the fire opening. The brick hearth itself extended only to the inside edge of this opening. The shelf for the rivets was cast as part of the frame piece and extended direct from the opening

and on a level with the fire. This design, however, was at times unsatisfactory. The heat generated invariably resulted in a loosening of the rivets holding the frame, and this in turn was followed by a burning of the edges of the shell itself. In addition burning of the rivet shelf resulted. With the new design the fire-clay liner extending over and around the edges prevents a direct contact of the fire with the sheet steel casing, and the placing of the shelf on a lower level, in one piece with the bottom plate of the fire chamber, prevents all possibility of a burnt-out shelf.

The forge consists essentially of a welded steel oil tank on which is mounted a head, or fire chamber. This head is made up of a circular steel plate housing held between the cast-iron top and bottom plates by means of three bolts. The lining of the fire chamber is a one-piece, circular section of firebrick 2 in. thick at the sides and 2½ in. thick at the bottom.

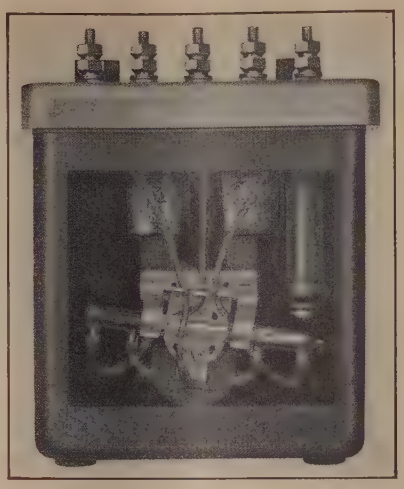
The oil tank is tested under a pressure of 125 lb. to insure against leakage. Air is supplied by a single connection which furnishes pressure for the oil supply, as well as for the atomizer. Kerosene, distillate or any fuel oil is burned in this forge.

The unit illustrated is portable and especially adapted for use on construction work. It can be moved about by one man.

Automatic Signal Flasher Relay

AN AUTOMATIC electric flasher designed for railway grade crossings and highway signals has been placed on the market recently by the Bossard Railway Signal Corporation, Troy, N. Y. The device is registered under the trademark "Bossard Flashmore." This company supplies the flasher relay only and the signal itself may be of any kind of construction requiring two lights to flash alternately upon the approach of a car or train.

The distinguishing feature of this relay is the absence of metal contacts. As the current is broken through a mercury contact within a sealed glass tube, in which the air has been replaced by inert gases, there is no possibility of oxidation of mercury. The relay has an armature oscillating between the poles of an electromagnet. To this armature shaft



New Flasher Relay with Mercury Contact

is fastened a pendulum which is oscillated by the electric current in one direction. With the opening of the circuit, the pendulum returns automatically to its original position by gravity. The glass tube is mounted on this pendulum and has four contact pockets, into which leads are sealed for carrying the current.

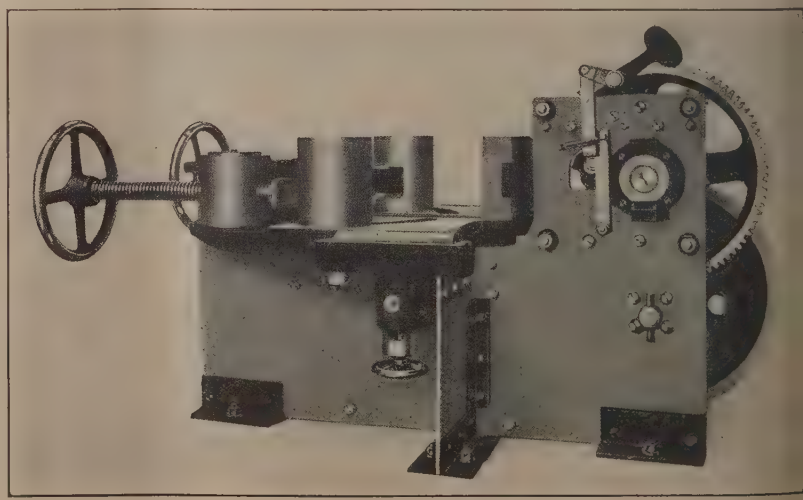
The magnetic field is independent from the load current and therefore constant under all conditions of the load circuit, regardless of how few or how many lamps are being used. The burning out of lamps or the adding of more lamps, therefore, does not affect the brilliancy of the light or the speed of the flasher.

The weight of the pendulum holds the contact tube in such a position that both contact pockets, which control the air circuit through one set of lamps and through the magnet coils, are closed. This provides a safeguard in case of failure of the operating mechanism as it displays a set of lights as a warning. Where the flasher is used in connection wit electric railway installations whic use direct current for propulsion, can be set in operation by means c interlocking relays operated by alte nating-current track circuits, supe imposed upon the direct-current pr pulsion circuit.

New Bending and Straight ening Machine

A NEW horizontal eccentric bend ing and straightening machin particularly adapted for bendin rails, bars, angles, beams, etc., i being offered to the trade by Henr Pels & Company, Inc., New York N. Y. This machine has a ver heavy steel plate frame, steel gears and forged shafts and pinions.

The table is especially wide an has a horizontal roll on each sid which facilitates handling of mate rial. The bending blocks are ad justed independently of each othe by hand wheels and screws that mov them in the arc grooves. The bend ing blocks move forward or backwar on an arc, the center distance thu being shortened when near the ram head and lengthened as they recede This movement automatically accom modates the varying sizes of section and lengths of radius. The arc lin of travel of the bending blocks ha been determined from the momen of resistance of various sections fig ured theoretically and combined with results of actual tests. When bend ing track rails or similar heavy sec tions it is advisable to use fille blocks between the ramhead and the section with the bending blocks wel separated. Any length of rail can b run through the machine as is found necessary.



Horizontal Eccentric Bending and Straightening Machine

The News of the Industry

Mayor Ready to Act

Chicago Executive Said to Be Prepared to Pay $162,000,000 for Surface Lines

Events indicate that Mayor Dever of Chicago is ready to recommend to the City Council that the city buy the Chicago Surface Lines at the price set in the 1907 traction ordinance—$162,000,000 as the capital account now stands—now that conferences with the Surface Lines officials have been suspended, while similar negotiations with the officials of the Chicago Rapid Transit Lines are ready to proceed.

At the eleventh conference between city officials and bankers and Surface Lines officers it was virtually agreed that the bankers and the security holders would stick to their contention that the full price should be paid.

The bankers, particularly, are reported to have informed the Mayor that a dangerous precedent would be established if the security holders were requested to repudiate a part of their holdings. Inasmuch as a market for the Schwartz municipalization certificates must be created, the city officials would be virtually unable to proceed with the municipalization project without the bankers' co-operation. That co-operation, it is reported, would not have been forthcoming unless every security was taken up dollar for dollar.

Included in the $162,000,000 purchase price is $6,000,000 in new rolling stock and extensions which has not increased the price to the city. In addition, the lines will turn over to the city their renewal fund of $14,000,000 and the personal-injury fund of $5,000,000, thus bringing the actual price down to $141,000,000.

Upon the completion of the negotiations, Mayor Dever, in a special message to the City Council will set forth his reasons for believing that the municipalization of the traction properties is desirable. The Mayor was one of the leaders in the municipal ownership fights twenty years ago in the Council, and he is hopeful that the Council as now organized will give him friendly support in what he regards as the most important problem before the administration.

Queens Abandonment Hearing Adjourned

Before Supreme Court Justice Joseph Aspinall, in Long Island City, on June 4, the political aspect of the transit situation in New York city was brought out with prominence when the argument was heard on the motion of Gen. Lincoln C. Andrews, receiver of the New York & Queens County Railway, for an order permitting him to abandon service on the lines and to surrender the company's franchises.

Col. William N. Dyckman, associate counsel with H. P. Williams, representing the receiver, objected to an adjournment for a week that had been asked for by Assistant Corporation Counsel Vincent Victory unless the court would grant the adjournment on conditions.

One of these conditions, as stated by Colonel Dyckman, was that the members of the Board of Estimate of the city of New York would go with representatives of the railway to the Transit Commission and join in a request for an increased fare. Mr. Dyckman said:

> We know the feelings of the members of the Board of Estimate, and the head of this city, and the board's willingness to destroy railway property in this city. We want a condition made in the order of this court granting the adjournment that the Board of Estimate must go to the Transit Commission and ask them for an increased fare. We believe that with such an order in his hand to back him up, Borough President Connolly can make some headway with the Board of Estimate.

Justice Aspinall granted the request of the city authorities for a week's adjournment, but refused to impose the conditions requested by representatives of the railway. So it would appear that maintenance or abandonment of lines serving 40,000 a day after that date depends upon Mayor Hylan.

Borough President Connolly has announced that he will bring the matter before the Board of Estimate on June 9 when it meets as a committee of the whole.

Railway Rejects Cleveland Wage Award

Men Granted Twelve-Cent Advance, but Company Asserts Finding Is Not Fair Because of Proved Prejudice of Fifth Member of the Board of Arbitration—Situation Appears Tense

PLATFORM employees of the Cleveland Railway, Cleveland, Ohio, numbering some 3,000 motormen and conductors, were on June 3 awarded a wage increase of 12 cents an hour by a board of arbitration, from which the company withdrew its representatives after the first session following the submission of evidence and arguments The men had sought a 15-cent increase. The wage increase means that dating back from May 1 the men are to receive 67 cents an hour for the first three months of service, 69 cents an hour for the next nine months and 72 cents an hour after the first year, instead of 55, 57 and 60.

Representatives of the Cleveland Railway assert that the award of the board of arbitration will not be carried out. William Polk, president of the local street car men's union, says that a strike will be called if necessary to enforce the award.

After four days of public hearings the work of taking evidence from both the men and the company was ended on May 26. Arguments were heard on May 27 by attorneys representing both sides. After a private meeting by the arbitrators on May 28 Attorney Carl Higley and Thomas P. Schmidt, representing the company, declared their intention to withdraw from the board on the ground that the fifth man on the board, James W. Holcomb, formerly city street railway commissioner, instead of being neutral, was actually prejudiced in favor of the men.

John J. Stanley, president of the railway, notified Mr. Holcomb that the company considered that he had disqualified himself and that the company would not participate in the deliberations of the arbitration board. Directors of the Cleveland Railway met and approved of Mr. Stanley's stand, pointing out that the company would repudiate any decision arrived at by Mr. Holcomb and the two representatives of the union on the board.

The company based its repudiation of the arbitration board and its award upon Mr. Holcomb's attitude during the taking of evidence, his comments during the hearings and the fact that four days after he had been agreed upon as the fifth man in the arbitration proceedings a letter had been sent by John G. Owens, secretary of the Cleveland Federation of Labor, to the Senators from Ohio at Washington indorsing Mr. Holcomb for the position of United States Collector of Customs at Cleveland. In this letter Mr. Owens stated that Mr. Holcomb was qualified for the post, that the labor federation of Cleveland indorsed him and that he had been named as the arbitrator in the wage dispute between the railway and its employees.

In announcing the wage increase of 12 cents an hour, the three members of the board of arbitration participating in the award also allowed the company platform employees fifteen minutes' time for making out accident reports, but rejected all other demands of the union for changes in working conditions. Union officials say the award is satisfactory.

In a statement appended to the award, Mr. Holcomb and his two colleagues representing the union, United States District Attorney A. E. Bernsteen and Max Hayes, editor of a Cleveland labor publication, said that they would back the car men in getting the award and that the decision was reached without bias or prejudice.

The statement also asserted that the award would cost the company approximately $966,400 additional each year and that the fifteen minutes' pay

allowed for making out accident reports would cost an additional $12,000. The statement claimed that the company could offset the increased charges against it by reason of the higher pay if it managed to reduced the amount of damage claims paid annually and if it consented to a reduction in its allowance for maintenance, depreciation and renewal.

Accident and damage claims paid by the company last year were $1,582,595, or nearly 10 per cent of the gross earnings, while according to the majority of the board of arbitrators the cost of damage claims in Detroit is only 1.26 per cent of the gross earnings; Boston, 1.75 per cent; Cincinnati, 1.85 per cent, and Chicago, 2.5 per cent.

The statement of the majority of the board also pointed out that by reason of an increase in the company's maintenance fund from 10 to 12 cents a car-mile in the latter part of 1921, the company in 1922 not only wiped out a deficit of $240,000 but piled up $1,182,252 as a reserve fund in this account and stocked up with materials and supplies to the amount of $1,158,235.

According to the majority report, the company could pay the increased wage allowed if it made the saving the board felt it could in its claims for damages and in its maintenance fund and still have a balance left of more than $742,363.

If the company insists upon not signing a new contract with the union containing the increased wage award, union officials say that a strike vote will be taken, but that they will attempt to prevent a cessation of service in Cleveland until after the Republican national convention, which is set to start June 10.

Decree Signed in New Jersey Fare Case

Federal Judge Rellstab of the United States District Court at Trenton, N. J., on May 28 signed a final decree permanently enjoining the Board of Public Utility Commissioners of New Jersey from enforcing its order of July, 1921, fixing fares at 7 cents, with 2 cents for a transfer, on lines of the Public Service Railway. Accordingly, the present fare schedules, including the zoning system, will continue in effect.

The decree also contains a clause setting forth that counsel shall be heard in the United States District Court at Trenton June 9 on the question of costs of operating the lines. Included in the costs is $25,000 which the railway by direction of Judge Rellstab, has paid to former Federal Judge Thomas G. Haight of Jersey City, as special master.

Reference to the ruling of the court in this connection was made in the ELECTRIC RAILWAY JOURNAL for May 31, page 869.

Five-Cent Fare With Tickets in Tacoma

The Tacoma Railway & Power Company, Tacoma, Wash., has arranged with city officials for a 5-cent ticket fare, with the $1 weekly pass to be continued in effect. The new fare does not include transfer privileges. It became effective on June 1. On its part the city has agreed not to issue any more permits for buses other than those which the Mayor might see fit to allow the company to operate during the experimental period of six months while the new fare is being tried out.

At an early conference, other details of the proposed agreement, including the question of paving between tracks, will be threshed out. City officials will co-operate with the company in an effort to cut down its expenses in paving.

Railway officials say that only the operation of the new system over an experimental period will settle the question of whether or not the system of selling tokens at the rate of twenty for $1 will have a satisfactory appeal in view of the proposed continuance of the weekly pass at $1.

Cincinnati Contract Renewed for Two Years

Members of the carmen's union, Local No. 11, recently voted to renew their present contract with the Cincinnati Traction Company, Cincinnati, for a term of two years. The vote was 826 for the renewal and 265 against. The present agreement is based on a maximum wage of 53 cents an hour, with 7 cents an hour additional for operators of one-man cars. The clause concerning schedules of "owl" cars refers to the time that their operators start to work. Formerly the men on the "owls" reported for work at 7:45 p.m. and went off duty at 5:45 a.m. Under the present schedule they start to work at 11 p.m. and quit at 8:15 a.m. The men believe that the former schedule is preferable. A clause regarding regular crews on regular cars refers to the fact that the men wish to be supplied with a regular car and be permitted to use it daily as long as it is in running order.

Several weeks ago the men turned down a proposition submitted by the union's board of directors in which it was proposed to renew the present agreement for one year.

Group Insurance Policies for Roanoke Employees

A group life insurance policy under the terms of which the 315 employees of the Roanoke Railway & Electric Company, Roanoke, Va., receive protection of $1,000 each has been placed with the Metropolitan Life Insurance Company. A total of approximately $350,000 in insurance is involved in the policy. The premiums will be paid on a contributory basis, with the employers and workers sharing in this cost. In the event of illness, an insured employee of the company may summon a Metropolitan nurse who will assist in the care of the patient and see that the instructions of the attending physician are followed. In addition to this service, the Metropolitan will distribute to these new policyholders at frequent intervals the instructive pamphlets published by that company. These, compiled by experts, deal with timely health and sanitation subjects.

Want Five-Cent Fare in East Boston

Like several of the other zones in Boston which have obtained a 5-cent local fare from the Elevated, the East Boston district desires to be classed as a zone on the system, so that the 5-cent fare may be granted. It wants a 5-cent fare through the tunnel at least as far as Devonshire Street. James F. Jackson, chairman of the board of trustees, has explained that the question whether to grant a 5-cent fare within the limits of East Boston from one section to another may not take very long to decide, but the idea of granting it on the rapid transit system is entirely new to the service. The 5-cent fare thus far applies entirely to the surface cars. The trustees say that under the law they cannot make the general reduction now suggested until the company has liquidated the advance made by the communities which helped the company take care of its deficit during the year 1919.

Seattle Tax Case Reviewed

Three judges in the United States District Court at Seattle took under advisement on June 2 applications of the Old Colony Trust Company and the Puget Sound Power & Light Company for temporary injunctions restraining the Sheriff of King County from selling the power company's holdings to satisfy street railway taxes assessed for 1919. The details of the purchase by the city of Seattle from the power company of the street-railway lines were reviewed, as well as the court proceedings subsequent thereto and recent action taken to obtain payment of taxes. The Old Colony Trust Company received permission to file a supplemental bill, and motions of the defendants for dismissal were taken under advisement.

James B. Howe, representing the power company, argued that the county authorities had no right to levy upon the power company's present property, on which all taxes have been paid for 1919, for taxes on the street-railway property, on which property the state Supreme Court and the United States Supreme Court have held the taxes to be a specific lien. By the terms of the contract and deed conveying the car lines to city, Mr. Howe asserted, the company and the city agreed that each should pay taxes for that portion of the year 1919 during which title to property was held by it, the city being thus obligated to pay three-fourths of the taxes, with interest and costs, and the power company one-fourth. The Corporation Counsel of Seattle asserted that the city was not properly a defendant in the action and moved for dismissal. The intimation that the city and the county were in collusion to force company to pay the entire taxes for the year 1919 was vigorously denied.

On June 5 the three United States District Court Judges who heard the arguments dismissed the corporation's application for an injunction. The court held that it had no jurisdiction in the case of the trust company and that in the case of the utility the company had an adequate remedy in law.

Hearing for Increased Fare Petition

The Maine Public Utilities Commission has issued notice for a hearing on a petition filed by the Androscoggin Electric Company, which operates the Lewiston and Portland interurban system, asking for increased fares. Under the proposed schedule the fare between Lewiston and Portland would be raised from 93 cents to $1.00, with corresponding adjustments on intermediate fares; the charge for special car service would be increased from 75 cents to 85 cents per mile, with a minimum charge for such service raised from $10 to $15. These new rates have been suspended until Aug. 15 pending hearing and investigation.

Effort to Stop Fare Increase in Baltimore Fails

An effort to prevent the United Railways & Electric Company, Baltimore, from putting into effect the 8-cent cash fare for single fares or two tickets for 15 cents, recently granted by the commission, failed in court on May 31 and the fare order became effective on June 1. The attempt to have the court halt the increase was made by Mayor Howard W. Jackson, who sought both a temporary and permanent injunction as a taxpayer and also in the name of the Mayor and City Council.

City Solicitor Philip B. Perlman contended that the Public Service Commission had no right to fix fare rates without a valuation of the company's property except in an emergency. This valuation has been ordered by the commission and will require several months.

Judge Charles F. Stein in Circuit Court ruled that to grant the injunction he must find the order void because it is unreasonable or unlawful. He said that he must assume that the Public Service Commission acted upon the evidence presented. The court made it plain that in acting upon the application for a temporary injunction it was not expressing any opinion on the evidence.

A hearing date will be set in the near future on the appeal for a permanent injunction.

Bus Project in Syracuse Still Pending

Syracuse, N. Y., is apparently no nearer having bus lines in operation than it was months ago. Several firms have applied for franchises or licenses to operate lines on James Street, one of the best residential sections of the city, but the Common Council has opposed granting the permits.

The Syracuse Railroad Co-ordinated Bus Lines, Inc., a subsidiary of the New York State Railways, has been formed to operate bus lines. No decision has been reached as to what fare is to be charged or what form the bus lines will operate under, franchise or license. The city insisted a short time ago on a 5-cent fare and transfers, but this stand has been modified. The railway is understood to feel that a 10-cent bus fare would be necessary under its proposal if the bus lines are to be made self-supporting from their start, while the other interests that have signified their desire to be permitted to operate bus lines have indicated that they believe an 8-cent fare would prove sufficient to return a profit under the proposal advanced by them.

Ten New Buses Being Run by Indiana Interurban

The Indiana, Columbus & Eastern Traction Company, which operates bus lines paralleling its railway from Dayton to Columbus, Ohio, and from Springfield to Lakeview, Ohio, has increased its bus service by placing ten new Fageol buses of the latest design in service on its two bus divisions. Each of the new cars accommodates twenty-two passengers. The new buses replace 7-passenger Studebaker cars.

Despite the fact that they are slower than the electric cars with which they compete, many persons seem to prefer the buses in summer, according to F. A. Healy, treasurer of the company, and since the company sells transportation it was decided to give the riding public what they want. There are several competing bus lines which cover the same territory.

Reports Favorably on Investigation Into Boston "L" Additions

The joint rules committee of the Massachusetts Legislature has reported favorably a joint resolve providing for an investigation into methods for financing additions, extensions and improvements of the Boston Elevated Railway systems and of the advisability of terminating or continuing public operation. The resolve was recommended by the Metropolitan Planning division when it appeared that the system was unable to finance needed improvements and was favored at the hearing before the committee by H. Ware Barnum, general counsel for the trustees of the road. Mr. Barnum said the road would need $1,500,000 for additional equipment in the extension of the Shawmut branch in Dorchester. He also informed the committee that the extension of the Boylston Street subway was under consideration and the extension of the rapid transit service from Lechmere Square to North Cambridge. He said that 125 additional steel cars were needed for replacements and 400 modern semi-convertible cars, at a total cost of $10,000,000.

Relief from Congestion Suggested in Chicago

Conference of Transportation Interests There to Agree on the Terms of Traffic Order from State Commerce Commission to Go Into Effect in Loop District on July 1

Plans for reducing loop traffic congestion in Chicago through a rerouting of both surface line cars and west side buses have been tentatively agreed upon by city officials and representatives of both the Surface Lines and the Chicago Motor Coach Company, in a hearing called before the Illinois Commerce Commission.

In opening the hearing, Col. Frank A. Smith, chairman of the commission, said the commission felt it to be its duty to co-operate with the city to the end that transportation facilities, especially in the loop district, might be speeded up and made safer for the public.

Maj. R. F. Kelker then explained to the commission members the plan which has already been tentatively agreed upon by representatives of the Surface Lines and the city, by which it is hoped that service on the lines can be increased by about 30 per cent and at the same time create a clearer passage for other vehicles.

Installation of the plan, described in detail in this paper, issue of May 3, page 683, will entail the expenditure of approximately $100,000 on the part of the Surface Lines. Among its features are:

1. Twenty left-hand turns in the loop district bounded by Wabash Avenue, Wells Street, Lake Street and Harrison Street, will be eliminated, leaving only five left-hand turns within the same district.
2. At the same time the right-hand turns will be cut from thirty-eight to twenty-six within this district, and two of the present sub-terminals in the loop will be eliminated, leaving only one.
3. Changes will be made in the routes of thirty-two car-lines.
4. Washington Street buses will turn on Clark Street instead of on State Street, according to the agreement.
5. State Street is to be left clear for through traffic, and except in emergencies, the third track on State Street is not to be used.
6. West side street cars will use Dearborn Street as a turning point instead of State Street.

"In a normal twenty-four hour period," Maj. Kelker told the commission, "street cars in the loop proper at present make just 6,092 left turns. Under the proposed plan, these left-hand turns in that period would be reduced to 1,920. Similarly, the right-hand turns will be reduced from 16,486 to 14,225.

"An actual check of the flow of pedestrians and vehicles at the corner of State and Madison Streets in one hour of the afternoon showed 46,600 pedestrians and 2,000 vehicles entered that intersection. It is the right- and left-hand turns of street cars and buses in State Street that blocks this traffic constantly, and under the proposed plan many of these turns are to be eliminated in the loop area."

The benefits of the new plan will come about through the construction of eight new curves and the removal of four or five elevated structure columns from the middle of the street to behind the sidewalke line, Maj. Kelker explained to the commission.

Attorneys for the three interested parties were instructed by Chairman Smith to agree on the terms of an order which will be submitted to the commission within a few days. After that, the new traffic plan will be submitted to the Council for changes in the city ordinances, permitting the plan to go into operation, which it is hoped will be about July 1.

Hornell Traction Goes Back to Eight-Cent Fare

The Public Service Commission permitted the Hornell Traction Company Hornell, N. Y., on June 2 to return to an 8-cent fare which it had charged in its operating zone up to May 1. The commission, on the request of Receiver Page, permitted the company to reduce its fare to 7 cents, believing that the smaller fare would attract more patronage and increase the revenues of the company. This move, the receiver learned, was not a successful one, and he asked that the road be again permitted to charge the 8 cents if operations were to continue. The receiver says that under the 8-cent fare the average daily earnings of the company from Jan. 1 to May 1 were $150.70, while from May 1 to May 13 the average daily earnings under the 7-cent fare were $115.25. Since May 13, the receiver says, the revenues of the company has continued to go down until they run from $90 to 100 per day.

Ottawa Wage Agreement Continued

An agreement was entered into on May 19 between the Ottawa Electric Railway, Ottawa, Canada, and its Amalgamated employees whereby the contract signed in 1922 will continue in effect until May 1, 1926, with the following principal changes.

All permanent employees who are paid by the hour except shop hands and apprentices will receive 1 cent an hour increase for the period from May 1, 1924, to April 30, 1925, and 2 cents an hour increase for the period from May 1, 1925, to April 30, 1926, over the wage rates in effect on April 30, 1923.

The wage rates for conductors and motormen beginning May 1 are 44 cents for the first year, 46 cents for the second year, 47 cents for the third year and 49 cents for the fourth year and thereafter. On May 1, 1925, these rates will be increased to 45 cents, 47 cents, 48 cents and 50 cents respectively.

The other clauses of the agreement signed in 1922 continued in effect until May 1, 1926. The important items which are not changed are time and one-half for overtime on week days for a standard day of nine hours, time and one-quarter for work on Sundays and legal holidays and one-half cost of uniforms for first year and free thereafter.

Wage Contract in Toledo Remains

After three weeks of negotiations a new contract has been worked out between the Community Traction Company, and officials of the car men's union at Toledo which is substantially the same as the one which expired on May 21, 1924.

Wages remain the same. They were 50 cents an hour for the first three months, 52 cents for the succeeding nine months and 55 cents an hour thereafter. One-man car operators are granted 5 cents an hour extra. Only minor changes were made in some of the working conditions.

The men had asked for a 20 per cent wage increase and changes in working conditions, including two weeks' vacation with pay and closed shop on the entire property. At one stage the company had proposed a compromise vacation of one week with pay to men with the company more than five years, but that was voted down by the men.

Parking Rules Suggested

New York State Conference of Mayors Would Fix Drastic Limits on Trolley Traveled Streets

A committee appointed by the New York State Conference of Mayors has just reported to that body on the parking evil. The committee is headed by Mayor John A. Giles of Binghamton. It believes that in congested districts no parking should be allowed in a street in which surface cars operate unless there is room for at least one line of travel 10 ft. in width between the street car area and a line of vehicles parked at the curb. In streets in which trolley cars do not operate parking should be prohibited unless there is room for one line of travel in each direction or 20 ft. in width to accommodate both lines of travel, between cars parked at either curb or between the curb and one line of vehicles at the opposite curb. This is the very minimum under which parking should be allowed. The committee says this will not, however, solve the parking problem, for traffic will be impeded and often interrupted and the fire hazard will be great.

The committee says that under such conditions, and with parallel parking, the minimum width of roadway should be as follows:

Streets with a single trolley line, 47 ft. roadway.
Streets with a double trolley line, 57 ft. roadway.
Streets with no trolley line, 38 ft. roadway.

It is the belief of the committee that traffic will not be seriously affected and fire hazards will be practically eliminated if parking is allowed only in a congested street the roadway of which will accommodate two lines of moving traffic and one line of parked cars between the street car area and the curb or two lines of traffic in either direction between cars parked at either curb in streets where trolley cars do not operate. Under such conditions and with parallel parking, the committee feels that the minimum width of roadway should be as follows:

Streets with a single trolley line, 67-ft. roadway.
Streets with a double trolley line, 77-ft. roadway.
Streets with no trolley line, 58-ft. roadway.

The committee says that whether parking should be prohibited absolutely or in part in streets whose widths are greater than those previously specified depends upon traffic conditions. It says that no general recommendation can be made for such streets.

The committee says that time limits on parking should be established on all streets where parking is permitted to prevent all-day and all-night storage of vehicles. The length of the parking period should be determined by the demand and need for parking capacity.

The committee says:

We believe that cities either should provide parking space in or near the congested district or should encourage private capital to do so, either before parking is prohibited or greatly curtailed or as soon afterward as possible. When minor or side streets, vacant lots, parks and squares and interiors of blocks will no longer meet the needs there should be provided garages, either privately or publicly owned, and operated for half-day and day storage. Our data show that as long as parking is allowed private capital hesitates to invest in large downtown garages. Cities should also encourage the construction of garages in sub-center districts.

Additional Bus Permits Sought by New Jersey Railway

The Board of Public Utility Commissioners of New Jersey has set June 9 as the date for a hearing on the request of the Public Service Railway to take its cars off what is known as the Fifth-Broadway line in Camden, a crosstown service. Two buses of the Public Service Transportation Company, a subsidiary of the railway, are now rendering service in the area.

Effective on June 8, the railway has notified the commission that it will reduce from 7 to 5 cents its single fares on eight bus lines in the city of Camden and environs.

The railway will abandon service on the Kenilworth line, operating between Westfield Avenue and Kenilworth. The Public Service sets forth that for the year 1922 the gross receipts from the line were $10,571 and that the cost of operation, including taxes, but excluding fixed charges or any return on capital invested, was $25,139. In the last three months of 1923 the gross receipts were $874 and costs $6,000.

Fort Wayne People Save Weekly Passes and Get Prizes

As the hundredth week of the successful régime of the weekly pass in Fort Wayne, Ind., approached, it was rumored that the Indiana Service Corporation intended to give a prize to everyone holding the complete set of ninety-nine passes. The railway, of course, had nothing of this kind in mind, but the rumors became so prevalent that the company sensing the value of such publicity, made a formal announcement that prizes would be given. It was thought improbable that many people had saved the entire ninety-nine passes and therefore the company made the offer a little more lenient by extending the prizes to those who had saved fifty consecutive passes.

To the surprise of the officials of the company, fifteen people presented themselves at the cashier's office the morning the prizes were awarded. Eleven had fifty consecutive weekly passes and each received a prize of $1. Four had the entire one hundred passes and each of these four received $2.

The announcement of the intention to award the prizes and the later announcement of the winners were made in a quarter page advertisement in the local newspapers. As indicated before, the company was led into the matter indirectly by the rumbling rumors, but the stunt afforded an opportunity for some splendid publicity, and produced considerable favorable comment and increased the good will among the riders.

Mr. Storrs Will Attend Advertising Meeting in London

L. S. Storrs, president of the Connecticut Company, New Haven, will go as a delegate from the American Electric Railway Association to the international convention of the Advertising Clubs of the World in London beginning on July 16. At that meeting the Public Utility Advertising Section of the Advertising Clubs of America will participate in the deliberations. Lord Ashfield, chairman and managing director of the so-called underground group of transportation interests, who began his railway career in the United States as Albert H. Stanley, will welcome the American delegation. Mr. Storrs will respond on behalf of the American utility delegation.

News Notes

Will Fight for More Subways.—The Brooklyn Chamber of Commerce is concentrating all its efforts in bringing before Mayor Hylan and Borough President Riegelmann the need for the speedy construction of the Brooklyn crosstown subway and the completion of the Fourteenth Street-Eastern District line. The chamber is now proceeding under a new slogan, called "Throw Dirt, but Not the City Hall Kind." At a recent luncheon at which this principle was advocated more than fifty representative business men pledged support to the movement.

Wants Increased Fares.—The Washington, Baltimore & Annapolis Electric Railroad, maintaining service from Washington, Baltimore and Annapolis, has petitioned the Maryland Public Service Commission for permission to increase its fares 20 per cent on single tickets and round trip tickets and 10 per cent on commutation books.

Railway to Substitute Bus. — The Aurora, Plainfield & Joliet Railroad has petitioned the Illinois Commerce Commission for permission to discontinue railway service between Joliet and Aurora. It is the purpose of the company to operate buses between the two cities. No opposition is expected on the part of Joliet or Aurora to the company's plan, but it is understood that the two cities will insist that the commission, if it sees fit to grant the permit, shall insist that the tracks be removed and the roadway restored.

Railway Man Heads Jury in Slayer's Case.—F. D. Hoffmann, assistant secretary and assistant treasurer of the Chicago Surface Lines, is foreman of the Grand Jury which has before it the case of Leopold and Loeb, confessed slayers of Robert Franks.

Eight-Cent Fare in Kingston. — The Public Service Commission issued an order on June 4 permitting the Kingston Consolidated Railroad, Kingston, N. Y., to increase its cash or ticket fare to 8 cents. No change is made in the present regulation as to transfers, school or other reduced rate tickets.

Fare Testimony Closes.—At the conclusion of the presentation of the last evidence bearing on the question of fare rates in the state of Connecticut the Public Utilities Commission on May 26 ordered the Connecticut Company, which is petitioning for approval of a rate advance in Bridgeport and corporation counsels of several cities opposing an advance already put into effect outside of Bridgeport, to file briefs by June 16. The briefs were ordered submitted simultaneously. The commission, however, extended until June 23 the time for the filing of rebuttal briefs by both sides.

Bus Company Authorized to Compete with Railway. — The Richmond Rapid Transit Company, Richmond, Va., has been authorized to operate over Broad Street for thirty blocks through the heart of the city in competition with the Virginia Railway & Power Company's electric lines and over the protest of the railway. Formerly touring cars of independent operators competed with the railway, but these were legislated off street car routes.

Negotiating on Wages.—Negotiations are in progress looking toward a settlement of the wage controversy between the Rochester, Lockport & Buffalo Railroad, Rochester, N. Y., and its employees. The men claim they are being paid 4 cents an hour less than the employees of the Rochester & Syracuse Railroad, which operates between Rochester and Syracuse. John Pallace is representing the employees and is conferring with William W. Foster, general manager. If they fail to agree formal arbitration will take place.

Mr. Sawyer Entertains Veterans.—The East St. Louis & Suburban Railway Twenty-five-Year Club held its second annual meeting recently in the offices of W. H. Sawyer, president of the company, who is an honorary member of the club. Tribute in the form of a memorial was paid to the memory of D. S. Van Houten, a charter member of the club, who died in February. Eight new members who had attained the coveted twenty-five years of continuous service were admitted to the club rolls. The business session was followed by an automobile trip through beautiful Forest Park in St. Louis, after which the club members went to the Missouri Athletic Club for dinner. Place cards were in the form of checks for $25 each.

"Claims Department" Abolished as Title.—The name "Claim Department" was abolished on June 1 by the Chicago Surface Lines. For it has been substituted the "Department of Accident Investigation." Frank J. Gatrell, who has had the title of "General Claim Agent," is now known as "Superintendent Department of Accident Investigation." The new title is not so suggestive as the old one and really much more fittingly describes the scope of the activity of this particular department of the company.

Bill Provides for Eight Hours in Eleven.—The Massachusetts House instead of ordering an investigation into the question of eight hours in eleven for street railway employees recently substituted a bill providing for eight hours in eleven. The vote on the roll call was 137 to 62. The bill was originally filed by Representative George E. Keegan, Lawrence, an official of the union of the Eastern Massachusetts Street Railway. Although the committee on street railways reported against it, the bill was adopted in the Senate over the recommendation of the committee, but the Senate later voted for a resolve for an investigation by the Department of Public Utilities. When the matter came before the House the ways and means committee reported in favor of the investigation, but when the resolve came up in the House Representative Keegan and the other spokesmen for the carmen and labor were able to swing the House for the bill over the objection of the ways and means committee. The bill now goes back to the Senate.

Cancellation of Commutation Asked.—The San Diego Electric Railway, San Diego, Cal., has applied to the Railroad Commission jointly with the San Diego & Coronado Ferry Company for authority to cancel the present monthly commutation ticket between San Diego and Coronado, which is sold at the rate of $4. It is alleged that since the weekly passes were installed on the San Diego Electric Railway by authority of the Railroad Commission the sales of commutation tickets do not justify the cost of printing them.

Fares Higher in Rhode Island.—The United Electric Railways, Providence, R. I., on June 1 introduced an 8-cent cash fare or a token rate of 7 cents. From Pawtucket to Providence a distance of four miles, the fare is sixteen cents. From Pawtucket to Cumberland, six miles, the fare amounts to thirty-two cents.

Buses to Replace Railway for Trial Period.—The City Council of Oskaloosa, Iowa, has passed a resolution which permits the Oskaloosa Traction & Light Company to operate motor buses instead of street cars. M. G. Linn, local manager of the Illinois Power & Light Company at Oskaloosa, which controls the railway there, has explained that the bus service is to be a trial, subject to the restoration of the railway service, if the citizens desire it. Better service with buses than with street cars is promised by the company. There are 8 miles of electric railway in Oskaloosa.

Bus Franchise Granted.—The City Council of Jamestown, N. Y., has granted a twenty-year bus franchise to the Jamestown Motor-Bus Transportation Corporation, a recently formed subsidiary of the Jamestown Street Railway. The franchise calls for operation at an 8-cent fare and a 7-cent ticket charge. Transfers are free from bus to bus, but cost 3 cents from bus to trolley. Bus service on the north and south side of the city, which was discontinued early this winter, is to be resumed within three months.

Complaints Dismissed. — Complaints of the cities of Oakland, Berkeley, and San Leandro, against the Key System Transit Company, successor of San Francisco-Oakland Terminal Railways, alleging discrimination in the matter of school children's fares in favor of the city of Richmond, have been dismissed by the California Railroad Commission. The alleged discrimination was removed through acceptance by the company of uniform school children fares in the East Bay district as recommended by the commission.

Financial and Corporate

$863,646 Net for Detroit United

President Stevenson Optimistic—Has Important Expansion Program Under Way—Doesn't Fear Buses

The Detroit United Railway, Detroit & Port Huron Shore Line Railway, Detroit, Monroe & Toledo Short Line Railway, Detroit, Jackson & Chicago Railway and the Detroit United Railway Trucking Company report income for the year ended Dec. 31, 1923, of $863,646 before making provision for depreciation or contingencies transferred to surplus account.

STATEMENT OF EARNINGS OF DETROIT UNITED RAILWAY AND SUBSIDIARY COMPANIES FOR THE YEAR ENDED DEC. 31, 1923

		Amount
Gross earnings from operations:		
Passenger		$7,257,895
Freight and express		1,548,389
Mail		19,194
Special car		38,121
Total gross, earnings from operations		$8,863,599
Deduct—Operating expenses before providing for depreciation		7,243,271
Net earnings from operations		$1,620,328
Add—Proportion of interest received with respect to balance owing by city of Detroit for purchase of company's city properties	$220,832	
Other income	652,751	873,583
Gross income, less operating expenses		$2,493,911
Deduct—Interest on funded and floating debt	$1,789,387	
Less—proportion of interest received with respect to balance owing by city of Detroit credited upon the books of the company to interest on funded debt	732,787	$1,056,600
Taxes		573,665
Together		$1,630,265
Balance—Income for the year before making provision for depreciation or contingencies transferred to surplus account		$863,646

President Elliot G. Stevenson has reviewed at considerable length the affairs of the company, particularly details with regard to transactions conducted with the city over the purchase of the lines. He says that his statement as to the ability of the company to continue to pay dividends at the present rate is based not upon speculations but upon facts that seem to him to warrant the forecast. He says it must be borne in mind that during 1923 there was a large increase in the rate of wages of platform men and other employees. This increase in the wages of the men became effective, by agreement, on Aug. 1, 1923, but the increases were made retroactive to May 1, 1923. These increases are reflected in the operating costs of the company for 1923. They aggregate $400,000.

It was not until the end of 1923, says Mr. Stevenson, that the company got any relief by way of increases in rates of fare to compensate for this increased expense. Indeed, as to the Rapid Railway, one of the company's principal properties, the new rate had not become effective on March 18 this year. From experience to date, as to passenger traffic carried and revenues received therefor, the indication is that the increase in the passenger revenue from the increased rate of fare will amount to about $600,000, more than double the amount of the profits that are being realized on the city purchase contract.

In addition the company has formulated plans to alter, in some important respects, its present method of operation and confidently expects that this change will save the company from $300,000 to $500,000 a year. It will take from three to six months to give effect to these plans.

Mr. Stevenson says that he does not, in any way, wish to minimize the effects of bus competition, but with an experience now extending over nearly two years in dealing with this competition, he feels that it is not going to defeat the expectations of the company of profitable operation of its properties.

IMPORTANT FREIGHT PLANS UNDER WAY

The statement is made that the company has under consideration the development, principally by the construction of some new connecting lines, of another source of revenue that promises to be almost, if not quite, as important as the passenger revenue. The reference is to revenue from express and freight, the increased profits from which will, Mr. Stevenson believes, more than offset any reduction in passenger revenue due to bus competition. During the year 1923 the revenues of the company from this source amounted to $1,548,388. When certain financing, referred to in detail in the report, has been completed, the company will have available about $2,500,000 to provide for needed extensions—filling in gaps. Mr. Stevenson is confident that the revenue from freight and express traffic will be doubled within a year. He says that the study and formulation of the plans in this connection have consumed much time, but that they are now well matured and ready to be carried forward to execution. Limitations of space prescribed by the annual report prevented him from telling the story in detail.

TRACK MILEAGE OF DETROIT UNITED RAILWAY DEC. 31, 1923

	1923	1922	Increase
Detroit United Railway	264.3645	260.2763	4.0882
Rapid Railway System	142.8816	142.8375	0.0441
Detroit, Monroe & Toledo Short Line Railway	84.8458	84.0946	0.7512
Detroit, Jackson & Chicago Railway	111.6987	111.6782	0.0205
Total	603.7906	598.8866	4.9040

PASSENGER STATISTICS OF DETROIT-UNITED RAILWAY, YEAR 1923

Revenue passengers carried	53,671,114
Free transfers	3,895,242
Employees	930,785
Total	58,497,141
Receipts per revenue passenger	13.52 cents
Receipts per total passenger	12.41 cents

MILEAGE STATISTICS OF DETROIT UNITED RAILWAY, YEAR 1923

Revenue car mileage	18,999,260
Earnings per car-mile	46.65 cents
Expenses per car-mile	38.12 cents
Net earnings per car-mile	8.53 cents

$105,000 Offered for Charleston-Isle of Palms Property

Peronneau R. Rivers, special master for the Charleston-Isle of Palms Traction Company, Charleston, S. C., recently offered the property at public auction. Confirmation of the sale appears to depend on purchase by the ferry commission of the two old steamboats and two wharves and the bridge connecting Mount Pleasant with Sullivan's Island.

J. D. Ernest Meyer offered $15,000 for the purely railway property. As chairman for the ferry commission, John P. DeVeaux offered $105,000 for parcel No. 1, two steamboats, two wharves and a bridge, provided the commission is declared to have authority for proceeding.

Arthur R. Young, offered $20,000 for parcel No. 2, the electric railroad and its appurtenances, provided the ferry commission purchase parcel No. 1. Mr. Young also offered $23,000 for parcel No. 3, the lighting plant, provided the ferry commission purchase parcel No. 1. Mr. Young, again acting for others, offered $2,000 for some real estate holdings.

The Charleston-Isle of Palms Traction Company has not been operating since the Sheriff of Charleston County took custody of the ferry boats because of non-payment of a verdict for damages.

The pavilion and some other properties at the Isle of Palms, the terminus of the electric railway, are not owned by the traction company.

It has been reported for some time that the Cooper River Ferry Commission was planning to make a bid for the two boats, and for the wharves and bridge. Meanwhile, the constitutionality of the act creating the commission is before the courts.

1924 Quarter of New York State Line Shows Improved Net

Increased profits for the quarter ended March 31, 1924, compared with the same period a year ago are shown in the official report of the New York State Railways, Syracuse, N. Y. A net income of $331,735 is shown, after interest, rents and other charges had been deducted. This is equivalent after the payment of preferred dividends to $1.42 a share on the $19,952,400 common stock outstanding. The net income figure for the same quarter a year ago was $274,302, or $1.13 a share on common stock. Operating revenues were $2,993,567 for the March, 1924, quarter. The operating expenses for the first quarter of the present year were $2,053,467. Lower taxes and lower non-operating income debit are factors in the increased net income.

Augusta Railway's Note Extension Requested

The Augusta-Aiken Railway & Electric Corporation, Augusta, Ga., through President Brown, has requested an extension of notes in a letter to the holders of the 5 per cent bonds and the 5 per cent notes, due June 1, 1924. He states that payment of interest on bonds can now be resumed provided the payment on notes is extended, into which the coupons were funded. He reminds the holders that five years ago and again two years ago they were requested to defer interest on their bonds by funding the coupons into an interest bearing note maturing this June. Holders of nearly 94 per cent of the bonds outstanding in the hands of the public agreed to this request. By their action he said the corporation had been brought through the difficult years following the war without receivership, and that out of the earnings the bank loans of $160,000 had been liquidated, and cash had been provided for necessary capital expenditures aggregating $540,000 for the five years.

He said though that some $722,000 of the notes were still outstanding. As a consideration for the extension it was proposed to pay interest on these notes at the rate of 6 per cent per annum instead of 5 per cent per annum as before. The extension is to be until Dec. 1, 1935, when the bonds fall due. He said that both securities could then be provided for by the same funding operation. Large bondholders had been consulted by the directors and had approved the extension, and agreed to co-operate in carrying the plan to completion. He said further that when sufficient notes had been deposited the extension would be declared effective, and there would be issued, instead of the deposited notes, bonds dated June 1, 1924, and maturing Dec. 1, 1935, carrying 6 per cent interest payable semi-annually and callable at any time at par and interest and secured by deposit of funded coupons.

Offer Made for American Electric Power Properties

The American Gas & Electric Company and the Appalachian Power Company are seeking control of the American Electric Power Company. Van Horn Ely, president of the American Electric Power Company, announced on May 29 that a contract had been signed whereby the two companies named have agreed to buy the common shares of that company at $62.50 a share.

The agreement provides that the contract will be binding if within fifteen days certain representations by the vendors are verified to the satisfaction of the purchasers, and also that not less than 75 per cent of the 189,200 shares of outstanding common stock of American Electric Power is deposited for delivery to the purchasers against payment. It is further said that a separate company may eventually acquire the electric railway lines of the American Electric Power Company.

The American Electric Power Company succeeded the American Railways Company, which was incorporated in New Jersey in 1900, representing a consolidation of the old American Railways Company and the United States Electric Railway & Light Company. It has an authorized capital of $17,000,000 common stock and $8,000,000 preferred.

Lake Shore Electric Railway Has Surplus

A surplus of $172,461 in 1923 was realized by the Lake Shore Electric Railway System, Cleveland, Ohio. In 1922 the surplus was $175,053. These facts are contained in the twenty-third annual report. The system comprises the Lake Shore Electric Railway, the Lorain Street Railroad, the Sandusky, Fremont & Southern Railway, the People's Light & Power Company and the Bellevue Illuminating & Power Company. By far the biggest part of the system is the Lake Shore Electric Railway, which alone spent $155,709 for additions and improvements chargeable to capital account. The first consolidated 6 per cent bonds of this company, $1,600,000 par value, matured on Jan. 1, 1923, and were extended for ten years at 6 per cent.

STATEMENT OF EARNINGS OF LAKE SHORE ELECTRIC RAILWAY ALONE

	1923	1922
Gross earnings	$2,235,662	$2,064,608
Operating and taxes	1,709,889	1,548,530
Net earnings	$525,772	$516,078
L. & C., T. F. & N. and 1st cons. interest	205,975	191,475
	$319,797	$324,603
All other interest	135,024	136,468
Surplus	$184,773	$188,134
Per cent of operation	76.48	75.05
Car-miles	4,055,508	3,770,237
Income per car-mile	55.12c	54.76c
Operating and taxes per car-mile	42.16c	41.07c
Net earnings per car-mile	12.96c	13.69c
Passengers carried	6,967,058	6,963,861
Earnings per passenger	22.03c	21.64c

Of the total gross earnings of $2,235,663 in 1923 the Cleveland division contributed $1,102,383, the Toledo division $916,885, the Sandusky-Norwalk division $55,989 and the city lines $160,406. Total passenger revenue for the year was $1,521,283 against $1,493,255 for the year previous. The biggest item included in operating expenses was for transportation, which amounted to $542,677, an increase of $68,308 over transportation expenses in 1922.

An evidence of the company's growth in business is seen in the comparative statement of gross earnings from 1902 to 1923. In 1902 the gross earnings were $466,051 and have been steadily increasing in practically every year up to 1923, when they were $2,235,663. It is to be noted that the banner year was 1920, when the gross earnings totaled $2,699,342.

The Lorain Street Railroad, a subsidiary of the Lake Shore Electric Railway System, carried 3,676,080 passengers in 1923, against 2,899,331 in 1922. The company finished the year, however, with a deficit of $33,441. The deficit the year before was $33,958.

The Sandusky, Fremont & Southern Railway carried 293,500 passengers in 1923 against 299,551 in 1922. Operation on that property resulted in a deficit in 1923 of $25,609 against $19,338 in 1922.

$400,000 of Notes Sold Direct in Four and a Half Days

The Galveston-Houston Electric Company, Houston, Tex., recently sold, locally, $400,000 of 7 per cent bond secured notes, as a means toward improving public relations and at the same time raising money to expand the street railway system in Houston. The improvements to be made are in accordance with a recent agreement between the city and the company, under which jitneys were eliminated, and certain improvements are to be made in the railway system.

The notes were issued in $100, $500 and $1,000 denominations. They were sold at par and accrued interest, either for cash or on the partial payment plan.

The partial payment plan was open to the public as well as to employees, but different methods were used in handling the accounts. The public was allowed to make ten monthly payments, the first to be paid when the notes were ordered. They were also allowed interest at the rate of 6 per cent until the principal had been paid in full, and 4 per cent if the order is concelled before making final payment. Employees were allowed to make twenty semi-monthly payments with installments deducted from the payroll checks and an allowance of interest at 7 per cent until final payment. Even if the employees subscription is cancelled before final payment is made by him he is allowed 7 per cent interest.

On the first day of the sale, meetings of all employees were held, the issue explained in detail, orders taken from members of the company, and all were urged to assist in promoting the sale of the notes. The trainmen were very active in talking to friends and passengers and other employees to people with whom they came in contact. In this manner, the names and addresses of prospective buyers were obtained, turned in to the office and some one sent to see each individual. When possible the person securing the prospective customer was allowed to complete the sale if possible. This method served a double purpose, that of stimulating the interest of the employee in the affairs of the company and also affording a quick follow-up system.

Advertising of the note sale was done by the company and a few of the local brokers. Company advertising was carried out by mailing circulars to 20,000 telephone users, stating the purpose of the issue and showing the financial status of the company, and by means of newspaper ads and news items, car ads—both dash signs and cards on inside of cars—and handbills distributed on the cars. In addition to this advertising, several local brokers ran notices of the sale in their regular advertising space.

The entire issue was sold in four and one-half selling days. Statistics showing the distribution of notes sold follow:

	Number	Amount
Public bought for cash	248	$333,400
Public bought on partial payment	118	7,000
Employees bought for cash	30	12,500
Employees bought on partial payment	450	71,700
Total	846	$424,600

New York & Harlem Has Deficit in First 1924 Quarter

It was brought out at the annual meeting of the New York & Harlem Railroad, New York, N. Y., that for the first quarter of 1924 the operation of the surface lines had produced a deficit of $7,169. In 1923 the deficit was $71,931. The total deficit since the return of the lines to their owners by the New York Railways on Feb. 1, 1920, is $311,769.

An agreement was reached with the receiver for the New York Railways entitling the company to have thirteen cars additional to 156 delivered to it on Feb. 1, 1920, besides additional material.

The claims of the company against the New York Railways aggregating more than $1,300,000 are on file with the receiver, but it is considered unlikely that any funds will be available from the sale of the New York Railway's property for distribution to general creditors. The reorganization plan of the New York Railways approved recently by the court does not contemplate the inclusion of the Harlem lines, but it is stated that securities of the new company may be reserved for such acquisition later.

The company owes the city special franchise taxes from 1920 to 1923 inclusive, amounting to $235,017. The company has paid $225,244 taxes accrued prior to Feb. 1, 1920, and left unpaid by the lessee, and $137,059 in taxes subsequent to that date. It has borrowed and now owes $912,000. Including that item total current liabilities on March 31 last were $1,936,597, against total current assets on that date of $668,326.

Winona Interurban Sold to Bondholder

The Winona Interurban Railway, extending a distance of 70 miles between Goshen and Peru, Ind., was sold on May 29 at a receiver's sale in Elkhart, Ind. James P. Goodrich, former Governor of Indiana, who held about 95 per cent of the outstanding bonds, was the only bidder. The property will be taken over immediately by the Winona Service Company, organized by Mr. Goodrich, his son Pierre and Samuel J. Mantel, a law clerk. The company is incorporated with 10,000 shares of no par value stock. As indicated previously in the ELECTRIC RAILWAY JOURNAL it is proposed to tie in the road with the lines of the Interstate Public Service Company for through operation of trains from Louisville through Indianapolis to South Bend and Chicago.

Net Income of Detroit Street Railways Increases in April

For the thirty days ended April 30, 1924, the City of Detroit, Department of Street Railways, reports a total revenue from transportation of $1,918,766, against $1,693,924 for the similar period in 1923. The total operating revenue, including that derived from the transportation, rent of track and other miscellaneous sources, was $1,961,012 in April, 1924, and $1,794,327 in April, 1923. Expenses for the month of April showed an increase, being $1,299,077 in 1923 and $1,388,299 in 1924. The net revenue was $572,713 in April, 1924, against $495,250 in April, 1923. The net income increased from $80,978 in April, 1923, to $99,969 in April, 1924. The number of passengers carried in April of this year was 41,228,817, while in April a year ago 41,685,537 passengers were carried.

Declares Lines Unprofitable. — In a statement before the Public Utilities Commission of Maine M. A. Williams, manager of the Portland Railroad, Portland, Me., operated under lease by the Cumberland County Power & Light Company, asserted that the Old Orchard and Saco lines were unprofitable and should be abandoned. At the same time the commission heard the petition of the Checker Cab Company for a bus license to operate to Old Orchard.

Rehabilitated Road Doing Well.—At a meeting of the directors of the New Haven & Shore Line Railway held in New Haven recently, the treasurer's reports showed the financial condition of the road to be very satisfactory. The committee which was appointed to investigate for the spur track into Hammonassett Park appeared before the Public Utilities Commission recently in Hartford. The commission has changed the original layout and after the park commission approves of this arrangement the work of tracking will begin at once. The company has been operating since July 17, 1923, the rehabilitated portion of the Shore Line Electric Railway from New Haven to Madison, Guilford and Saybrook.

Public Benefits $6,343,000.—The total tax bill of the Chicago Surface Lines, Chicago, Ill., this year, including the city's 55 per cent of the net receipts, amounts to nearly $5,000,000, according to an announcement made by G. A. Richardson, vice-president of the lines. Other public benefits, such as street paving, maintenance and cleaning of pavement, bring the total up to more than $6,343,000 for the year ended Jan. 31, last.

Tax Arrears Met.—The Public Service Railway's tax arrears for Newark, N. J., for 1917 and 1918 were cleared up recently by the payment of $190,558. The check represented a personal property tax of $158,182 and interest of $37,376, figured at a compromise rate of 4½ per cent.

Accumulated Surplus $16,938.—The Petaluma & Santa Rosa Railroad, operating from Petaluma, Sebastapol, Santa Rosa, Forestville, reports to the California Railroad Commission for the year 1923 that its operating revenue was $593,865, and operating expenses $440,885, giving a net operating revenue of $152,980. Interest, rent, taxes and other deductions totaled $103,365. The net corporate income for the year was $87,719. The surplus at the beginning of the year amounted to $8,224. Miscellaneous additions to surplus for 1923 amounted to $10,496 and miscellaneous deductions were $55,884. The company declared dividends of $33,616 during the year, leaving an accumulated surplus at the end of the year of $16,938.

Short Brooklyn Line Discontinued.—The old Montague Street surface line in Brooklyn has been discontinued under an order signed by Federal Judge Julius M. Mayer. Representations were made to the court that this line carried only about 150 passengers a day and was being operated at a loss of about $6,000 a year. The line runs from Court and Montague Streets to the old Montague Street ferry, a distance of about one-third of a mile. It is the last line operated by the Brooklyn Heights Railroad and virtually ends the receivership, which, however, will be continued until after proper legal proceedings have been carried out for its discharge.

Seeks Abandonment Permission.—Application has been made by the Peekskill Lighting & Railroad Company for approval by the Public Service Commission of its plan to abandon part of the railway system beginning on East Main Street in Peekskill, N. Y., and terminating at the end of the road on Five-Mile Turnpike, in Yorktown. The petition sets forth that the village of Peekskill desires to improve East Main Street. The improvement would cost $17,250, it is estimated, and the railway asserts that the travel on the line does not warrant the expenditure.

Piedmont Power & Light Absorbed.—The North Carolina Public Service Company, Inc., Greensboro, N. C., one of the subsidiaries of General Gas & Electric Corporation, has purchased outright all the property of the Piedmont Power & Light Company, operating in Gibsonville, Elon College, Burlington, Graham, Haw River, Relbano and adjacent territory. In February, 1924, the General Gas & Electric Corporation purchased the North Carolina Public Service Company. This was the first entry into North Carolina of the General Gas & Electric Corporation.

Will Vote on Sale.—The stockholders of the Jackson Railway & Light Company, Jackson, Tenn., will vote on June 23 on authorizing the sale of all the assets, properties and franchises of the company.

City Joins in Valuation Work.—The city of Fort Smith has decided to join the Fort Smith Light & Traction Company, Fort Smith, Ark., in making a valuation of all the properties in the city, including traction lines, electric and gas distribution, preliminary to possible rate changes. Burns & McDonnell, consulting engineers of Kansas City, have been employed by the city to work with the valuation engineers of the company in making a complete inventory of all the physical properties.

Defunct Line Bought.—The Pennsylvania & Ohio Traction Company, which ceased operation this winter, has been sold to Jacob Levine & Sons Company, junk dealers of Newcastle, Pa. The purchase price was $46,115. The company owned and operated the trolley line between Connaught and Jefferson, through Ashtabula. The sale included all of the personal property, including practically all the equipment. When the commission authorized discontinuance on the line this past winter it found that for the past five years the company had had a loss of more than $100 a day.

Legal Notes

DISTRICT OF COLUMBIA — *Automobile Driver May Assume Car Will Stop at Regular Stopping Place Where Passengers Are Waiting.*

The driver of an automobile saw a car approaching but expected it would stop at the regular stopping point, where passengers were waiting. The motorman did not do so, whether he was behind time or the car was fully loaded does not matter. He should have kept his car under control in such circumstances and the company was held responsible for the resulting collision. [George vs. Capital Traction Co., 295 Federal Rep., 965.]

FEDERAL COURTS — *Railroad Not Obligated to Pay Wages Under "National Agreement," as Modified by Labor Board.*

The "national agreement" between the railroads and their employees as to wages, etc., and the modifications thereof by the Railroad Labor Board, when accepted by a railroad, cre an implied contract to pay its employees accordingly. But as there is no agreement to continue these payments for any specified time, when the railroad reduced the wages, and these wages were accepted by individual employees, there was no contract or legal obligation on the company to pay higher wages. [Pennsylvania R.R. Federation No. 90, v. Pennsylvania R.R., 296 Federal Rep., 220.]

INDIANA—*Duty of Traveler at a Railway Crossing.*

The track at a railroad crossing is a warning of danger, whether the cars are operated by electricity or steam. One crossing such a track must use his eyes and ears, he must stop within a place of safety if a train is approaching and he must exercise ordinary care. [Guion vs. Terre Haute, Indianapolis & Eastern Traction Co., 143 N. E. Rep., 20.]

IOWA—*Damages Caused by Negligence Separable from Damages Non-Recoverable.*

Where an automobile, through the negligence of the driver, came into collison with a street car, the automobile owner could recover for damage caused by the motorman's negligence in backing his car after the collision, provided he could separate the amount of damages so sustained from the damages caused by the collision. [Tesdell vs. Des Moines City Railway, 197 N. W. Rep., 629.]

NEW JERSEY—*Utilities Board May Enjoin Unlawful Operation of Jitney.*

Where a state act requires the approval of the utilities board for the operation of a bus line, which is parallel to a railway line, the order of the board to the jitney line to cease operation is enforcible. The board may choose its remedy in law or equity, whichever may more speedily and effectively produce relief. Consequently, it is entitled to an injunction. [Board of Public Utility Commissioners vs. Sheldon et al, 124 Atlantic Rep., 65.]

NEW JERSEY—*Company Liable to Passenger Injured When Ejecting Fellow Passenger at Conductor's Request.*

A conductor called upon a passenger to aid him in ejecting a negro passenger, but after the latter drew a knife, the conductor withdrew from the attempt, and the assisting passenger was injured. The company was held liable. [Frazier vs. Public Service Railway, 123 Atlantic Rep., 867.]

NEW YORK—*City Track Employee May Be Engaged in Interstate Commerce.*

An employee was injured while putting in and tightening up bolts on a section of city track. The railway company sells through tickets good over its lines to Queenston, Canada, and it is possible for a passenger with one of these tickets to transfer to the city line on which the employee was injured. The Appellate Division held the employee was engaged in interstate commerce. [Borelli vs. International Railway, 203 New York Sup., 704.]

NEW YORK — *Determination of Status as Passenger of Person Assaulted.*

Where a motorman assaulted a person who had placed his foot on the first step of the car and was about to board it, the Appellate Division held that the jury should decide whether the plaintiff was a passenger. [Supple vs. International Railway, 203 New York Sup., 749.]

NEW YORK — *Action Where Engineer Refused to Give a Contractor a Certificate of Satisfaction with Work Performed.*

This case related to construction on a street railway, on which about $30,000 was paid upon progress certificates and $16,000, the balance on the contract, was refused. The Appellate Division held that in a contract requiring the work to be done to the satisfaction of the company's engineer and the work has been done substantially as required, a cause of action will lie, notwithstanding the refusal of the engineer to issue a certificate. On the other hand, the engineer's failure to object to work while it was being performed is no excuse for defective performance. [Hevenor vs. Union Railway, 204 New York Sup., 40.]

OHIO—*Assessment of Street Railway Franchise for Sewer Held Unauthorized.*

The section of the general code authorizing municipalities to levy assessments upon "specially benefited lots and lands" to pay a portion of the cost of public improvements therein named, does not authorize an assessment to pay a portion of the cost of a storm sewer to be levied upon the franchise of an electric railway occupying a portion of the streets. The railway does not have the exclusive use of the streets but uses it only in common with the public for the purposes of travel and in company with other public utilities. The rails, ties, poles, etc., do not constitute "lots or lands" within the meaning of the section. [Ohio Electric Railway vs. City of Greenville, 143 N. E. Rep., 193.]

OHIO—*Punitive Damages Not Collectible for Assault Unless Company Was Negligent in Employing or Retaining Servant.*

In an action for personal injury for an assault upon a passenger by the employee of an electric railway, punitive damages cannot be recovered against the corporation in the absence of evidence that the assault was authorized, participated in, or ratified by the corporation, or that the corporation had failed to exercise due and reasonable care in selecting or retaining its employee. [Columbus Railway Power & Light Co. vs. Harrison, 143 N. E. Rep., 32.]

PENNSYLVANIA — *Liability to Passengers Struck by Automobile When Entering or Leaving Car.*

A street railway company is not liable for the conduct of third persons who negligently injure intending passengers standing on the highway. Hence, it is not liable when such passengers are run down by an automobile in violation of law forbidding the passing of a standing car by an automobile except under special circumstances, though if the railway contributed to the accident by a very dazzling headlight or in other ways, it would be liable. [Klingensmith vs. West Penn Railways, 123 Atlantic Rep., 787.]

WEST VIRGINIA—*Failure of Motorman to Sound Warning Signal Immaterial if Driver Knew Car Was Approaching.*

An electric locomotive was waiting at a corner on a siding and a trolley car approached to pass it. As the trolley car entered the siding, the locomotive started without warning signal and struck an automobile passing from a cross street over the track. The court held that negligence of the company in this case could not be predicated on a failure of the locomotive motorman to give a warning signal if the person injured had knowledge of the approach of the locomotive in sufficient time to avoid injury. A judgment for the plaintiff was reversed and a new trial ordered. [Blackwood vs. Monongahela Valley Traction Co., 132 S. E. Rep., 359.]

WISCONSIN—*Railroad Commission May Take Paving Charges Into Consideration When Ordering Extension.*

Under the Wisconsin law the Railroad Commission has power to require a street railway to extend its line where public convenience and necessity require the extension and the construction and operation of the line will not impair the earnings of the railroad, so as to prevent an adequate or fair return. But where the city's demand that the company pay the cost of constructing the paving within the track zone on such extensions would affect the opportunity for the fair return, the commission should take this into consideration. [Madison Railways vs. Railroad Commission of Wisconsin, 198 N. W. Rep., 278.]

Personal Items

E. L. Graumlich Acting Commissioner in Toledo

E. L. Graumlich, engineering and operating assistant to Street Railway Commissioner W. E. Cann at Toledo, Ohio, was named by Mayor Brough and the Board of Control of Street Railways at Toledo as acting commissioner, effective June 1.

Mr. Graumlich went to Toledo at the time the Milner ordinance became effective two years ago and has had charge of both engineering and operating details in the commissioner's office. Many of the rerouting plans and schedule changes which have been put into effect were worked out by Mr. Graumlich.

Before that he was in the office of Fielder Sanders, street railway commissioner at Cleveland, Ohio. He entered the office of the commissioner there in 1917, first working on engineering projects. He was in the Coast Artillery Corps in the World War. After the war he was associated with rapid transit studies in Cleveland and with the commissioner there in charge of schedules and routes. His experience of nearly seven years has been entirely devoted to the commissioner's end of service-at-cost operation.

Mr. Graumlich is thirty-two years old. He is a graduate of the Case School of Applied Science at Cleveland.

Hugh Gordon, attorney for the California Railroad Commission for the last four and a half years, has tendered his resignation effective July 1. He will return to Los Angeles to resume the private practice of law. Prior to becoming attorney for the commission Mr. Gordon was assistant county counsel of Los Angeles County.

G. C. Estill, superintendent of way and structures of the New Orleans Public Service, Inc., has resigned to accept the position of vice-president and general manager of the new property of the Electric Bond & Share Company of New York at Miami, Fla.

Carl I. Wheat will succeed Hugh Gordon as attorney for the California Railroad Commission. Mr. Wheat has been assistant attorney for the past two years. Prior to becoming associated with the commission he was connected with a law firm in Los Angeles.

Ross Luellan has been appointed division freight and passenger agent for all the lines of the Union Traction Company from Anderson to Wabash and from Anderson to Muncie, Union City, Portland, Bluffton and New Castle. Mr. Luellan was formerly safety engineer at Anderson, Ind. In his new capacity he succeeds A. J. Hewitt, who was transferred to Indianapolis and will be division, passenger and freight agent for the Indianapolis territory.

Charles F. Lederer has resigned as general supervisor of rail welding of the Metal & Thermit Corporation, New York, to return as superintendent of way to the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., with which he was associated prior to joining the rail welding staff of the Metal & Thermit Corporation.

Daniel W. Snyder Appointed Vice-President of Illinois Traction

Daniel W. Snyder, Jr., who has been general manager of the properties of the Illinois Power & Light Corporation, Bloomington, Ill., since 1916, has been promoted to vice-president and a director of the Illinois Traction System, with headquarters at Springfield, Ill. The appointment became effective June 1. Mr. Snyder has full charge of operations of the interurban system with 550 miles of track operated from Peoria, Springfield, Danville, Decatur and Bloomington to St. Louis, Mo. His jurisdiction also includes the Illinois Valley division of the system operated between Ottawa and Streator and Joliet and Princeton, Ill.

D. W. Snyder, Jr.

C. F. Handshy, for many years manager of the interurban lines of the Illinois Traction System with offices at Springfield, Ill., will continue in that capacity. F. E. Fisher, Joliet, Ill., will continue as manager of the Illinois Valley division of the road.

The selection of Mr. Snyder as one of the leading operating heads of the Illinois Traction System is in line with the policy of the company to choose men from its own ranks for the positions higher up as soon as they are qualified to hold them. He is a young man, but has already had a wide experience in the public utility field in the management of railway, power, light and gas properties.

His first position in railway work was as superintendent of the Northampton Traction Company, Easton, Pa. Later he became general manager of the Clifton Gas & Electric Company, Clinton, Ill. In 1914 he accepted the position of general superintendent of the Jefferson City Light, Heat & Power Company and Jefferson City Bridge & Transit Company at Jefferson City, Mo.

Mr. Snyder became general manager of the Bloomington properties in 1916 which are now a part of the network of utilities operated by the Illinois Power & Light Corporation in five states of the Central West. In 1923 he was president of the Illinois State Electric Association.

E. O. Brown Made Manager at Bloomington

Edwin O. Brown, manager of the properties of the Illinois Power & Light Corporation at Galva, Ill., will succeed D. W. Snyder, Jr., as manager of that company at Bloomington, Ill.

Mr. Brown is well known in electrical activities in central Illinois. He is the son of E. L. Brown, Elmwood, Ill., a pioneer in the building of electric plants in the state. Mr. Brown entered the electric lighting business with his father at Elmwood.

In 1913 Mr. Brown and his father and those associated with them sold out their interests at Elmwood to the Hodenpyl-Hardy interests and went to Galva, Ill., where they built a plant and took over the electrical properties at Cambridge, Altona, Oneida, Victoria and LaFayette. These properties they operated until 1917, when they were taken over by the McKinley interests and Edwin O. Brown was made manager of them. In 1923 they were taken over by the Illinois Power & Light Corporation and Mr. Brown was retained as manager.

"Bud" Brown, as Edwin Brown is known, was born at Elmwood on Sept. 3, 1883. He was graduated from the Elmwood High School in 1901 and studied engineering at the University of Illinois. He entered business with his father immediately upon leaving the university in 1902.

Elmer E. Barnard, engineer of way and structures of the Lynchburg Traction & Light Company, Lynchburg, Va., and the Roanoke Railway & Electric Company, Roanoke, Va., has been appointed to the State Board for the Examination and Certification of Professional Engineers, Architects and Land Surveyors by Governor Trinkle. Mr. Barnard will fill out the term of office of the late Maj. Peyton B. Winfree, which expires July 15, 1928.

Obituary

John Emory Meek, vice-president of Johns-Manville, Inc., New York City, died on May 24. During his active career he served seven years with the Pennsylvania Railroad at Altoona, Pa., later going to Denver, and remaining there for six years, the last three of which he was chief engineer of the power plant. He entered the employ of the H. W. Johns Company, New York City, in 1894, and went with the H. W. Johns-Manville Company on its organization in 1902. He formed the railroad and United States government departments of this company in 1906, and he'd the position of general manager until March, 1924, when he was promoted to vice-president.

Manufactures and the Markets

News of and for Manufacturers—Market and Trade Conditions
A Department Open to Railways and Manufacturers
for Discussion of Manufacturing and Sales Matters

Mr. Hoover Urges Coal Storage

Secretary of Commerce Makes Plea for Co-operation in Handling Traffic Similar to That in 1923

Coal is again causing government officials concern. It is not the conditions in the coal industry itself to which department heads are now paying special attention, but the apparent indifference of industry in general to the need for anticipating the writer's requirements sufficiently ahead of the fall traffic movement to avoid a possible car shortage. During 1923 the railways through the co-operation of the manufacturing and distributing trades and the coal operators and distributors were able to handle the national coal traffic in a most efficient manner without car shortages. This was accomplished to a considerable degree by co-operation among the trades for the purchase and storage of coal during the summer season. The great danger point of traffic congestion, of course, is the fall season when the combined crop, winter goods, and household coal movements have always, except through last year's co-operation, combined to create a car shortage.

The fall car shortage always has the effect of increasing the price of coal and of seriously disturbing the whole economic machine. In this connection Herbert Hoover, Secretary of Commerce, points out that security lies in repeating the storage performance of last year, by the manufacturers of the country taking reserves of coal during the months of May, June and July, thus foregoing the necessity of coal shipments during the peak period in competition with the household movement. Outside of strike years, these summer months are universally the period in which lowest bituminous coal prices prevail.

Mr. Hoover has pointed out publicly that the country has a national problem before it in the matter of securing cheaper coal by maintaining more regularity in the production of coal mines through planning out its seasonal fluctuations. He says that this can only be brought about if the consumers are willing to store coal during the low production season.

These considerations Mr. Hoover has reiterated in a letter to the Secretary of the American Electric Railway Association in which he says there is, therefore, every transportation and financial reason for storing coal during the next few months in preparation for the autumn need. He considers it would be a contribution not only in the interest of the consumer but of the railways and the coal industry if the same successful results could be produced this year that the American Electric Railway Association so materially assisted in bringing about last year.

The association in turn is seeking to bring these matters to the attention of the large coal consumers from the point of view of their personal interest as well as a contribution to the mutual good of American business.

Soft Coal Production Lags

The average daily rate of soft coal production has remained for the last several weeks close to the lowest level touched during the entire period for which records exist, excepting only the period during the strikes of 1919 and 1922. Production of bituminous coal for the first 124 working days of the present year was 190,473,000 tons. For the same period during 1923 it was 218,591,000 tons.

There is some evidence that the rate of coal consumption is now somewhat lower than it was in the last quarter of the last year, when coal was being burned and exported at a rate of 10,200,000 tons a week. It is not probable, however, that it has fallen to so low a level as has production, which was only 7,155,000 tons for the week ended May 24. This was 35 per cent below the corresponding week a year ago. It follows, therefore, that consumers must be drawing quite heavily upon their stocks and stores.

General Electric Bookings Hold Up Well

Bookings of the General Electric Company, Schenectady, N. Y., during April and May have been at the rate of approximately $5,500,000 a week. New orders for the second quarter are expected to about equal those of the first, when new business taken on totaled $73,487,903, or about 5,650,000 a week. Bookings for the first six months of this year are expected to reach approximately $145,000,000, or at an annual rate of $290,000,000, which would compare with $304,199,746 actually booked in 1923 and $200,194,294 in 1922.

The company entered 1924 with $87,112,000 of unfilled orders. By June 30, if bookings for the six months reach $145,000,000, orders in the company's hands since Jan. 1, upon which it could work, would be $232,112,000.

Railway Bus Market Strong

B. A. Hegemen, Jr., president National Railway Appliance Company, New York, which is the Eastern selling agent for the Yellow Coach Manufacturing Company and sells buses exclusively to railways and railroads or to strictly non-competitive independent operators, reports that the demand for buses is very active. Mr. Hegemen states that there is a market for more buses than he can supply and hat sales in this department of the Appliance company would be much larger if more buses were available.

Trade Statistics Discussed

A conference was recently held in Washington, D. C., between the new Attorney-General of the United States

ELECTRIC RAILWAY MATERIAL PRICES—JUNE 3, 1924

Metals—New York

Copper, electrolytic, cents per lb.	12.75
Lead, cents per lb.	7.00
Nickel, cents per lb.	27.00
Zinc, cents per lb.	5.725
Tin, Straits, cents per lb.	40.875
Aluminum, 98 to 99 per cent, cents per lb.	27.50
Babbitt metal, warehouse, cents per lb.:	
Fair grade	60.00
Commercial	28.00

Bituminous Coal

Smokeless mine run, f.o.b vessel, Hampton Roads	$4.45
Somerset mine run, Boston	2.25
Pittsburgh mine run, Pittsburgh	1.875
Franklin, Ill., screenings, Chicago	2.175
Central, Ill., screenings, Chicago	1.90
Kansas screenings, Kansas City	2.50

Track Materials—Pittsburgh

Standard Bessemer steel rails, gross ton	$43.00
Standard open hearth rails, gross ton	43.00
Railroad spikes, drive, Pittsburgh base, cents per lb.	2.95
Tie plates (flat type), cents per lb.	2.52
Angle bars, cents per lb.	2.75
Rail bolts and nuts, Pittsburgh base, cents, lb.	4.00
Steel bars, cents per lb.	2.20
Ties, white oak, Chicago, 6 in. x 8 in. x 8½ ft.	$1.70

Hardware—Pittsburgh

Wire nails, base per keg	2.90
Sheet iron (28 gage), cents per lb.	3.60
Sheet iron, galvanized (28 gage), cents per lb.	4.80
Galvanized barbed wire, cents per lb.	3.70
Galvanized wire, ordinary, cents per lb.	2.65

Waste—New York

Waste, wool, cents per lb.	15
Waste, cotton (100 lb. bale), cents per lb.:	
White	12–18
Colored	9–14

Paints, Putty and Glass—New York

Linseed oil (5 bbl. lots), per gal.	$0.97
White lead (100 lb. keg), cents per lb.	12.25
Turpentine (bbl. lots), per gal.	$0.84
Car window glass (single strength), first three brackets, A quality, discount*	84.0%
Car window glass (single strength), first three brackets, B quality, discount*	86.0%
Car window glass (double strength) all sizes, A quality, discount*	85.0%
Putty, 100 lb. tins, cents per lb.	4–6

*These prices are f.o.b. works, boxing charges extra.

Wire—New York

Copper wire base, cents per lb.	15.25
Rubber-covered wire, No. 14, per 1,000 ft.	$6.35
Weatherproof wire base, cents per lb.	17.25

Paving Materials

Paving stone, granite, 4x8x4, f.o.b. Chicago, dressed, per sq.yd.	$3.60
Common, per sq.yd.	2.95
Wood block paving 3½, 16 treatment, N. Y., per sq.yd.	2.56
Paving brick 3½x8½x4, N. Y., per 1,000 in carload lots	53–54
Crushed stone, ¾-in., carload lots, N. Y., per cu.yd.	1.85
Cement, Chicago consumers' net prices, without bags	2.20
Gravel, ¾-in., cu.yd., f.o.b. N. Y.	1.75
Sand, cu.yd., N. Y.	1.00

Old Metals—New York and Chicago

Heavy copper, cents per lb.	10.25
Light copper, cents per lb.	8.50
Heavy brass, cents per lb.	6.00
Zinc, old scrap, cents per lb.	3.75
Yellow brass, cents per lb. (heavy)	6.00
Lead, cents per lb. (heavy)	5.625
Steel car axles, Chicago, net ton	$16.25
Cast iron car wheels, Chicago, gross ton	16.25
Rails (short), Chicago, gross ton	16.75
Rails, (relaying), Chicago, gross ton	26.50
Machine turnings, Chicago, gross ton	7.25

and lawyers interested in trade association activities. The Attorney-General gave no indication concerning any conclusions he may have formed on the subject of trade statistics and association activities, but intimated that he will make a careful study of this matter. It is planned to hold other conferences for the discussion of this subject.

Rolling Stock

Arkansas Central Power Company, Little Rock, Ark., has asked for bids on eight double-truck, double-end, lightweight city passenger cars. Specifications include four 35-hp. motors, total weight 30,000 lb. and seating capacity for forty-four passengers.

Pacific Electric Railway, Los Angeles, Cal., has specified the details for the 50 closed passenger cars and 5 electric locomotives recently ordered.

Date order was placed.....March 22
Builder of car body...J. G. Brill Company
Seating capacity 65
Total weight .....57,800 lb.
Bolster centers, length.....29 ft. 0 in.
Length over all .....52 ft. 2 in.
Truck wheelbase .....6 ft. 0 in.
Width over all .....9 ft. 1⅜ in.
Height, rail to trolley base...10 ft. 11½ in.
Body .....All-steel
Interior trim .....Cherry
Headlining .....Agasote
Roof .....Arch
Air brakes.....Westinghouse type SME
Armature bearings .....Friction
Axles..4½ in. diam. A. S. T. M. Spec. A19-21
Bumpers .....Channel iron
Car signal system .....Faraday
Car trimmings..O. M. Edwards and St. Louis
Center and side bearings.....St. Louis
Control..Westinghouse H. L. multiple unit
Couplers,
Westinghouse automatic air and electric
Curtain fixtures,
Curtain Supply Company ring type
Curtain material,
Pantasote color 86 pattern "J"
Destination signs .....Hunter illuminated
Door operating mechanism....Consolidated
Wheelguards .....Eclipse type F
Gears and pinions...Nuttall grade BP helical
Hand brakes .....Miner Ideal
Heater equipment..Consolidated truss plank
Headlights .....Crouse-Hinds type Z
Journal bearings .....Friction
Journal boxes.....Symington semi-steel
Lightning arresters .....Westinghouse
Motors,
4 Westinghouse No. 532, inside hung
Registers .....Ohmer
Sanders.....St. Louis, air operated
Sash fixtures .....O. M. Edwards
Seats .....Hale-Kilburn type 400-A
Seating material..Pantasote, Spanish finish
Slack adjuster .....Westinghouse
Springs ...Railway Steel Spring Company
Step treads .....Feralun
Trolley retrievers .....Ideal
Trolley base .....U. S. No. 13
Trolley wheels.....Kalamazoo No. 23
Trucks .....Commonwealth cast steel
Ventilators,
Automatic type ARDM Consolidated
Wheels .....24-in. Griffin F. C. S.

The details of the 5 electric locomotives follow:

Date of delivery....March and April, 1925
Builder of body...Pacific Electric Railway
Total weight .....127,000 lb.
Bolster centers, length .....17 ft. 8 in.
Length over all .....34 ft. 0 in.
Truck wheelbase .....7 ft. 4 in.
Width over all .....10 ft. 0 in.
Height, rail to trolley base....11 ft. 10½ in.
Body .....All-steel
Roof .....Arch
Air brakes.....Westinghouse, type EL 14
Armature bearings .....Friction
Axles.....Pollak A. S. T. M. Spec. A19-21
Bumpers .....Local castings C.I.
Center and side bearings..Local castings C.I.
Control.....General Electric type PCL
Couplers ....National Malleable Company
Gears and pinions..General Electric grade M.
Hand brakes .....Miner Ideal
Headlights .....Crouse-Hinds
Journal boxes.....Symington, semi-steel
Lightning arresters.....General Electric
Motors, type and number,
4 GE-251-A-205 hp., inside hung
Sanders...Local manufacture, air-operated
Springs ...Railway Steel Spring Company
Trolley base....Pacific Electric pneumatic
Trolley wheels.....Kalamazoo No. 23
Trucks .....Commonwealth cast steel
Ventilators .....Globe type
Wheels .....38½-in. steel tired

Track and Line

Washington Railway & Electric Company, Washington, D. C., during the present year will spend $400,000 on improvements in northeast Washington.

Portland Electric Power Company, Portland, Ore., is spending $15,000 in installing double cross-over tracks on Union Avenue and Holladay Avenue and at Grand Avenue and East Morrisson Street.

New Haven & Shore Line Railway, New Haven, Conn., has received permission to extend its line in the town of Madison to Long Island Sound through property owned by the state at Hammonassett Beach.

British Columbia Electric Railway, Vancouver, B. C., has awarded the contract for a tunnel 3,561 ft. long from Alouette Lake to Stave Lake to O. Olson, Maple Valley, Wash., for $331,600.

Binghamton Railway, Binghamton, N. Y., plans new trackage extensions in Binghamton to Johnson City at a cost of more than $100,000.

Power Houses, Shops and Buildings

Albany, N. Y., is to have a central bus terminal with a central station for seventeen interurban systems opposite the Plaza on Broadway in the business center of the city. The expense of constructing a waiting station and its maintenance are to be borne jointly by the various bus companies.

Pacific Northwest Traction Company, Everett, Wash., is planning immediate improvements in Mount Vernon and Skagit County which will cost more than $250,000. The plans include the construction of a large new stage depot and garage, to cost $15,000. The depot will have a platform covering three-quarters of an acre, with an inclosed portion 30x70 ft., for the accommodation of interurban buses. Several new bridges, new rails and miscellaneous improvements are planned on the company's system in Skagit County.

Philadelphia Rapid Transit Company, Philadelphia, Pa., is having plans prepared for superstructure of carhouses at Twentieth and Johnstown Streets at a cost of $300,000.

New York, N. Y.—The Transit Commission recently opened bids for the furnishing and erecting of structural steel for the electrical repair shop in the Coney Island yard for the Brooklyn-Manhattan Transit system. Twelve bids were received, the lowest of which was that of J. P. Clarke of the Grand Central Terminal for $66,137.50.

Atlantic City & Shore Railroad Company, Atlantic City, N. J., is planning to build a substation in Atlantic City, to cost about $75,000. A similar station will be built at Hammonton.

Trade Notes

Lawrence I. Grinnell has resigned as manager of publicity of the Metal & Thermit Corporation, New York, and as associate editor of *Reactions*, published by the company. Mr. Grinnell is now connected with the real estate firm of Douglas L. Elliman & Company, New York City.

Cleaton Company, Montreal, Canada, eastern Canadian representatives of the Conveyors Corporation of America, Chicago, has moved to its new office at 1070 Bleury Street, Montreal. The Cleaton organization handles the sale of American steam jet ash conveyors, American air-tight doors and other power plant specialties in Montreal and eastern Canada.

New York-Chicago.—The sales arrangements whereby the National Railway Appliance Company in New York and Holden & White, Inc., in Chicago, have acted as selling agents for the Drew Electric & Manufacturing Company, Cleveland, have been discontinued.

Economy Fuse & Manufacturing Company, Chicago, Ill., on June 1 removed its Chicago district sales office from 536 Transportation Building to larger quarters at 513 West Jackson Boulevard.

Paul J. Moore retired on June 1 as chief of the fire department at Newark, N. J., to become associated with the Foamite-Childs Corporation of Utica, N. Y., as a special representative of that concern's motor fire apparatus department. Chief Moore holds the distinction of having filled, by permanent appointment, every grade in the fire-fighting service. He will now be actively engaged in the educational work that the staff of the Foamite-Childs Corporation fire protection engineers are doing with the Foamite pumper as their latest development for modern fire fighting.

New Advertising Literature

Walter A. Zelnicker Supply Company, St. Louis, Mo., has issued bulletin No. 320, giving capacities and sizes of new oil storage tanks and tanks for use with air equipment.

Harris, Forbes & Company, New York, N. Y., have issued a booklet on public utilities. It traces the development of the public utility business in this country during the last forty years to its present position as the third largest industry in the United States from the point of view of invested capital.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued a comprehensive publication entitled "The Performance of Instrument Transformers." The new thirty-two-page book, which is known as Special Publication No. 1696, analyzes the factors underlying the performance of both current and voltage transformers and gives complete information for the successful application of these transformers to an electrical system.